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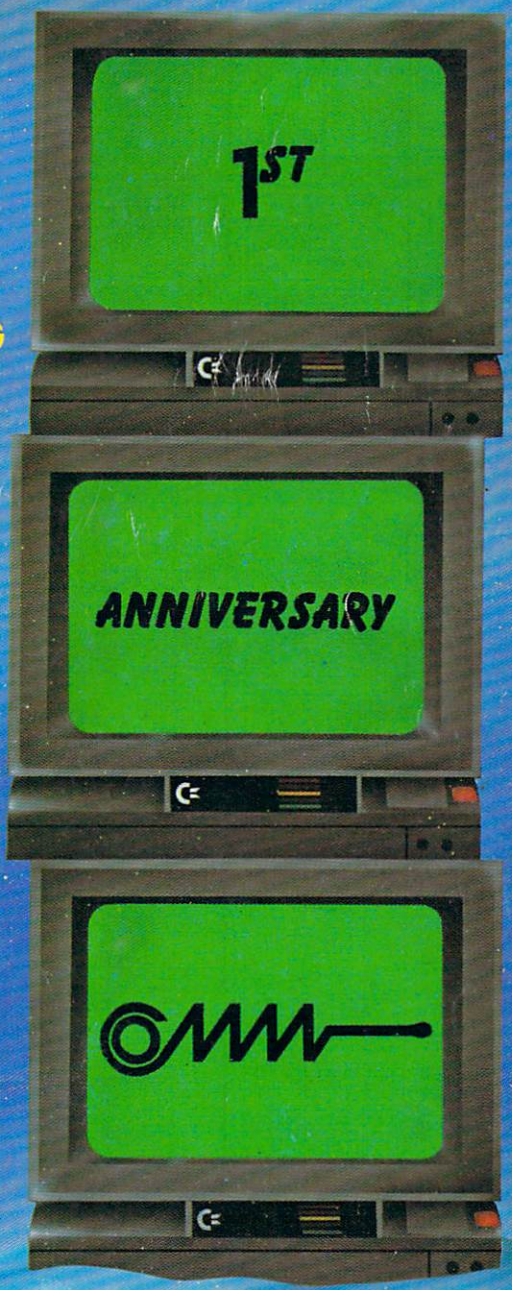
COMMANDER

SPECIAL ANNIVERSARY ISSUE

INSIDE:

- **MAKE YOUR COMPUTER SING FOR CHRISTMAS**
- **"BASIC" EDUCATION: PROGRAMMING FOR LEARNING**
- **"ROAD RACE" GAME FOR THE VIC-20**
- **QUICK COPY OF C-64 DISKS**
- **GREMLINS & IMPS - REVIEW OF THE NEW MSD DISK DRIVE AND MORE. . . .**



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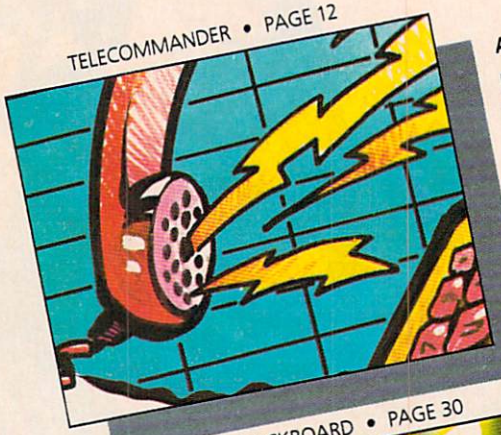

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Having reached the beginning of our second year, **COMMANDER** continues to look through the "electronic looking glass" of computer monitors toward an even bigger and better future.

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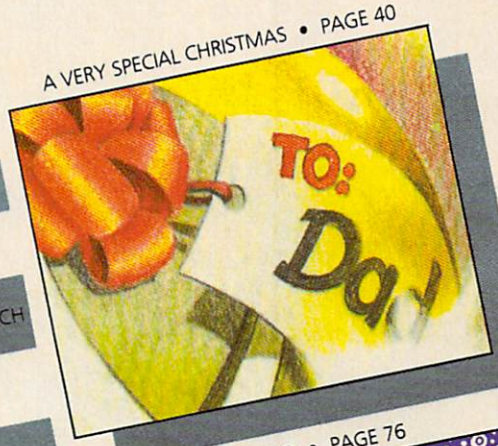

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A SHIFT IN TIME

In response to the rapidly increasing demand for our magazine, newsstand copies of *COMMANDER* will soon be circulated through a major, national distribution network, with a necessary adjustment in our publication schedule. The special issue you are now holding, which becomes available around December 1, 1983, is labeled December *and* January. The next issue, Vol. 2, Issue 2, will be labeled February 1984 and should be on sale by early January. All yearly subscribers, of course, will still receive 12 monthly issues. We hope this change causes no undue inconvenience, and appreciate your bearing with us during this growth period.

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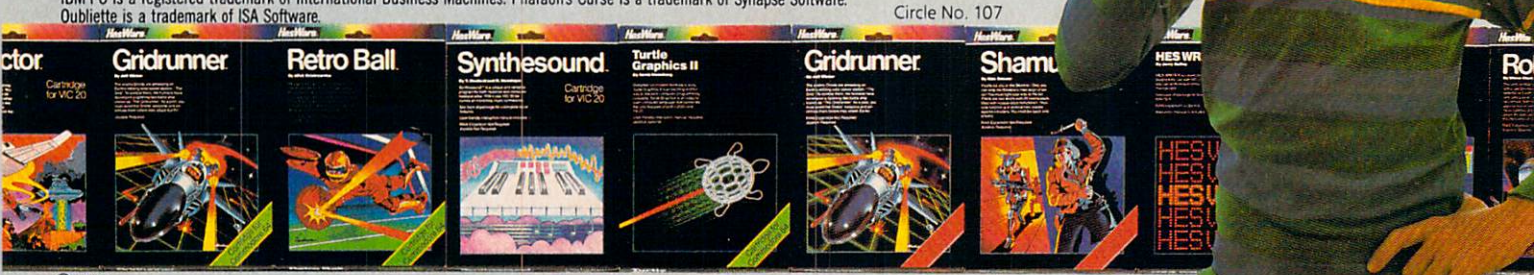

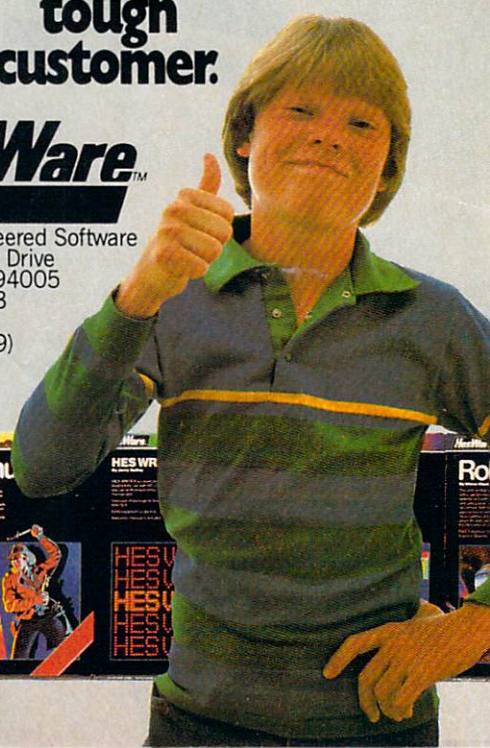

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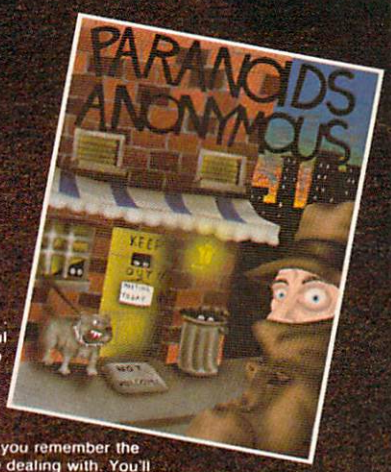

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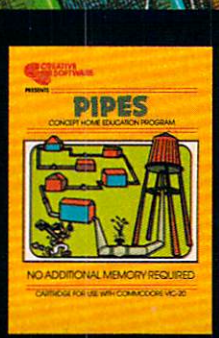

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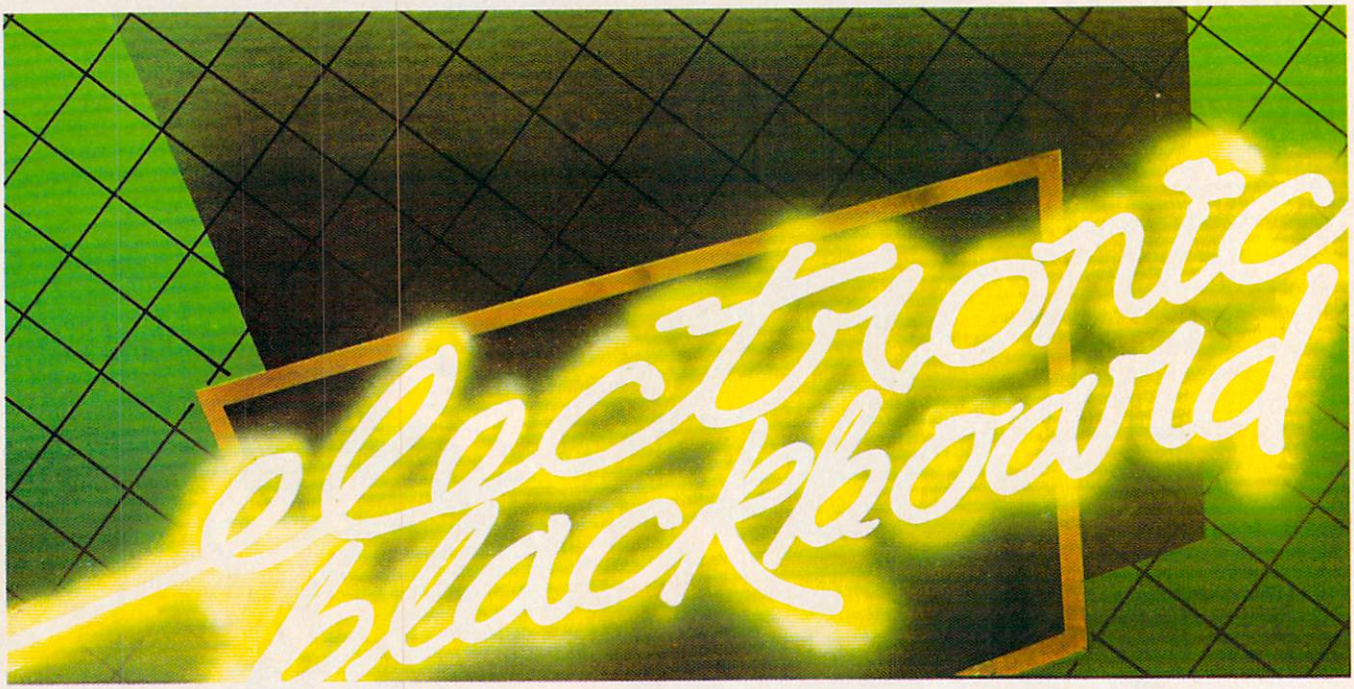


by Maryanne Dodd

I know there will be a multitude of COMMODORE computers under Christmas trees this year. Most of the older recipients have probably included a list of software with their request to Santa, but the very young tykes probably do not as yet understand just what this computer business is all about. In fact, many preschoolers and primary age children will probably be awestruck by the new machine that has come to live at their house. So, not wanting the youngest computer generation to be left out and also to get them off to a good start, I am devoting this month's reviews to computer introduction software for the very young set.

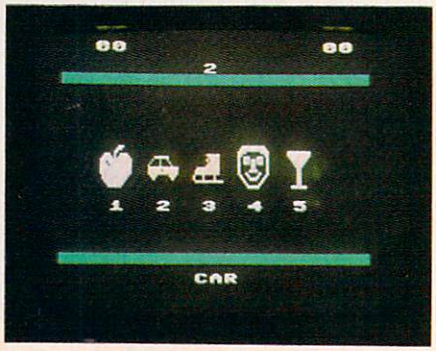
The name SPINNAKER has long been associated with educational software. They have built a reputation of providing first quality software using sound educational principles. Their philosophy includes providing nonviolent software that is fun for kids to use and learn at the same time.

FACEMAKER and KINDERCOMP are both older SPINNAKER favorites that were originally written for other systems but have recently been revised and translated for the COMMODORE 64. FACEMAKER is a program that introduces a youngster to the computer while allowing him to create and animate faces. KINDERCOMP is a set of six programs designed for the very youngest computerists that teaches letters, number sequences, matching and other readiness skills. KIDS ON KEYS is a new program that provides keyboard familiarity and reinforces beginning reading skills. All three of the programs can be used by children who are three and older with a minimum of adult supervision after a short initial introduction.

Some of the same SPINNAKER favorites are also available to VIC-20 owners from HUMAN ENGINEERED SOFTWARE. HES has secured the rights to translate and market some of the SPINNAKER products for the VIC-20. The HES products will carry the same titles and provide the same educational benefits.

FACEMAKER

KINDERCOMP



KIDS ON KEYS

Continued on page 37

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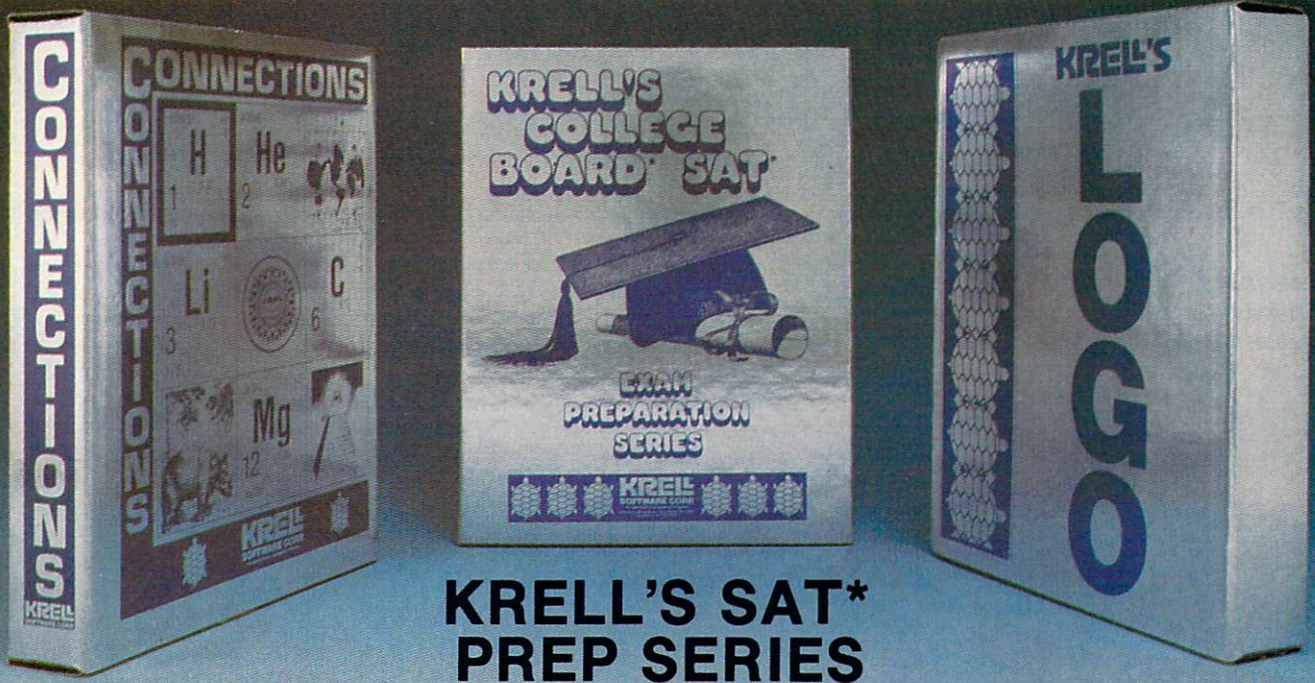

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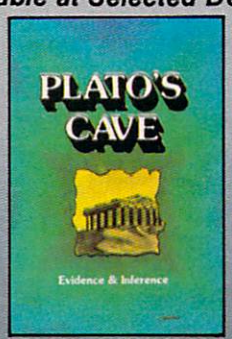

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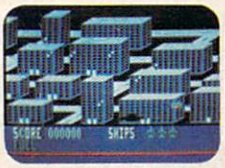

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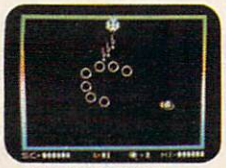

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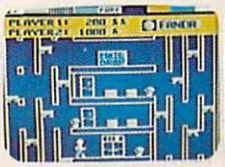

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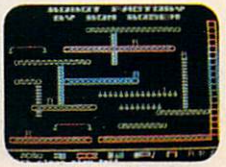

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TO THE FUTURE. . . .

For some people a first anniversary is a major event, worthy of deep, reflective meditation or intense, prolonged celebration. In our case, however, amidst the pressure of producing a monthly magazine whose growth and enthusiastic reader response demands ever-increasing efforts, we can only note in passing that we have reached a milestone and then refocus on the present and future of microcomputers in home and educational settings.

As Commodore continues to dominate the low-end, personal computer market, COMMANDER remains dedicated to providing you, the Commodore user, with the best independent source of definitive information, effective instruction, and enjoyable recreation. Since we strive to include material that appeals to the widest possible variety of interests, from serious utility to recreational applications and from beginning to advanced levels of sophistication, we hope you regard your copies of COMMANDER as permanent references instead of mere throwaways. We are also devoting more and more attention to issues and applications in educational computing, because the rapid changes in that area promise to revolutionize our school system–indeed, our whole concept of what education is.

Part of COMMANDER's growth is reflected in the expansion of our full-time editorial staff. In this issue we welcome Don Elman, Associate Editor, who relates below how he became involved with Commodore microcomputers.

Remember what the microcomputer world was like nearly two years ago? That's when my wife and I decided to be the first on our block (perhaps in the whole town) to own a home computer. Only a handful of strange little stores sold them; the choice among brands and models was small yet bewildering. Most consumer-oriented publications ignored them, mass advertising was virtually nonexistent, and the cost of a usable system ranged from "we could sell the car" to "we'll have to auction off our first-born child".

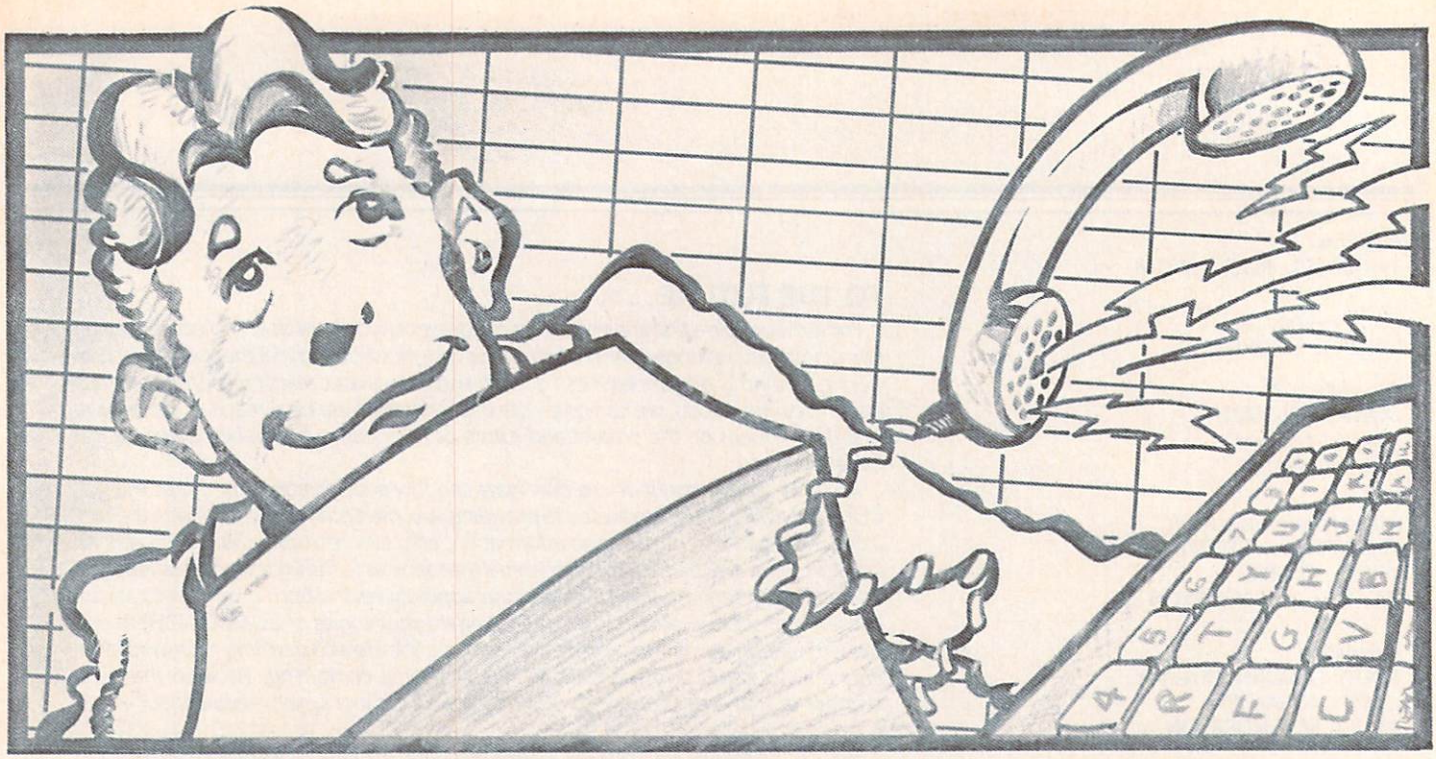
Against that background, I walked into my local computer store, prepared to incur serious debt in order to buy a fairly complete Atari 800 system. A very astute salesman, however, sized up my needs and resources and then convinced me that a small tan box with brown keys–looking like a stripped-down typewriter under Captain Kirk's benign smile–was a better buy. To be sure, there wasn't much software available (other than a few primitive games), and many of the peripherals I wanted (printer, modem, etc.) would not be available for weeks or months. Still, this "VIC-20" (presumably a poor cousin of 2001's HAL) seemed easy to program, had a comfortable keyboard, and did offer sound, color, and graphics for a "mere" $300.

Little did I suspect that my whimsical purchase was a harbinger of the farthest-ranging consumer market upheaval in recent memory. Within months we were subjected to the most intense national advertising battle since the Brillo-S.O.S. wars. The mass media treated the microcomputer as if it were a chip off the old diety. Soon, that odd-looking plastic box, whose price eventually dropped by more than two-thirds, became one of the most familiar items in every neighborhood discount store along with its higher-numbered look-alike. It showed up in my children's school, and even in the homes of neighbors who were anything but avant-garde.

Having had only a slight head start over most others, I was often surprised to find myself regarded as a local expert on home and educational computing. Among my most valuable sources of information were such independent publications as *COMMANDER*. I believe that education, as we have traditionally defined it, is on the verge of a magnificent revolution. The power of the microcomputer as an educational medium and motivator seems unlimited.

Whether it takes place in or out of school, the most enduring learning is intrinsically motivated–that is, immediately rewarding and, simply, fun. As *COMMANDER* embarks on its second exciting year, we hope to enhance your computer experience in both an educational and an enjoyable way. Please let us know whether we have succeeded, and how we can serve you better.

Don Elman



TELECOMMANDER

By Donald L. Stoner

HAM-COMPUTER COMMUNICATIONS

I have been receiving a tremendous amount of correspondence from other amateurs around the country. More than half of my unanswered letters are from hams!

Amateur radio is one of the most interesting aspects of electronics. With relatively simple and inexpensive equipment, hams are able to communicate with other radio amateurs in virtually every country of the world.

Thousands of progressive hams have connected computers to their two-way radios. This is accomplished with a device called a terminal unit. It is similar to a modem but has no telephone line interface.

Via radio waves, hams are able to do virtually all the things we do with modems on the telephone network (other than business communications). Hams have bulletin boards and message centers which can be contacted by radio. At the present time, the government is considering the adoption of new rules which will permit amateur radio licenses to be issued with a Morse code test. If this legislation passes, tens of thousands of computer "buffs" will apply for these "code-free" licenses so they can communicate by radio rather than by telephone.

A factor which reinforces this opinion is the upcoming increase in telephone rates. Even if your local telephone company is not able to extract the $50 per month "modem surcharge", telephone communication (either voice or data) is going to become increasingly expensive. Radio communication between computer owners, however, is going to become very attractive.

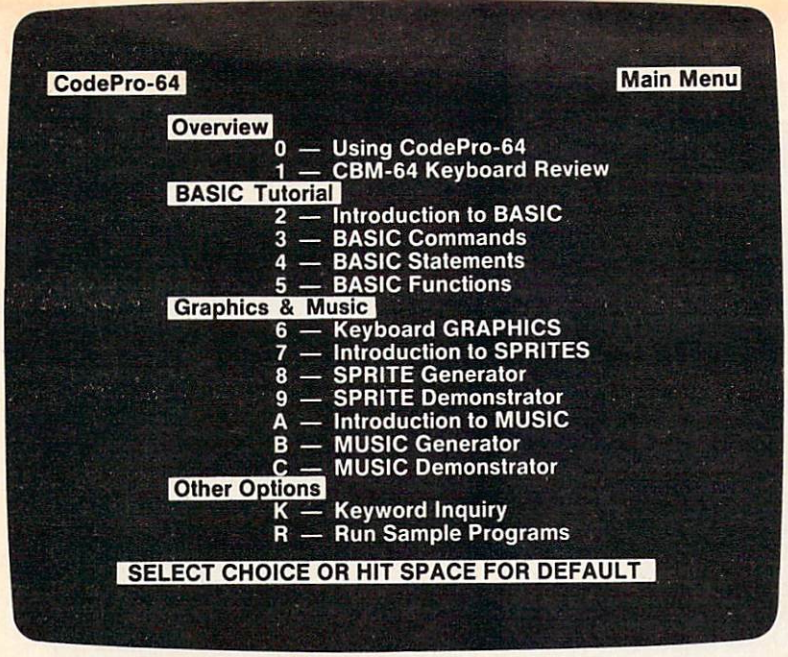
There is one significant difference between telephone and radio digital communications. On a telephone line, you are able to communicate both ways at the same time. This is called "full duplex" communications. However, a ham radio either transmits or receives at any given time. Thus, it is necessary to send your message, then switch the radio and terminal equipment to receive mode in order to obtain the response. This is called "half duplex" operation.

All the terminal programs I have seen published to date are written for full duplex telephone communications. This month I am including a program written specifically for radio communications. It features a variable baud rate selection plus one-key switching between the receive and tranmit modes. In addition, I've included "canned" messages which can be sent with a single keystroke.

The program, which is shown in Figure 1, fits within the memory of the unexpanded VIC-20 with 700 or so bytes to spare. I've omitted any fancy graphics to make the program compatible with the Commodore 64. To "rewrite" it for the C-64, you need only change a couple of POKES (see the remark in line 2).

After you have typed in the program, save a couple of copies before running it. As soon as you run the program, it will ask for the baud rate. The program will accept a 110, 300 or 1200 baud input, and can be modified for other rates. After this selection, the program opens the modem channel and initializes tables and variables.

When the screen clears and RX appears in the corner, the program is in the receive mode. The F1 key toggles the program between receive and transmit. When this key is pressed, the screen again clears and TX appears in the corner. At the same time, a POKE to the user port causes the DTR line to go low. This can be used to trip a relay by wiring up the circuit shown in Figure 2. As long as the input to the transistor is high, it will not conduct and the



NEW! For the Commodore 64™

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Now you can learn to code in BASIC and develop advanced programming skills with graphics, sprites and music—**visually.** You learn by interacting with CodePro-64, a new concept in interactive visual learning.

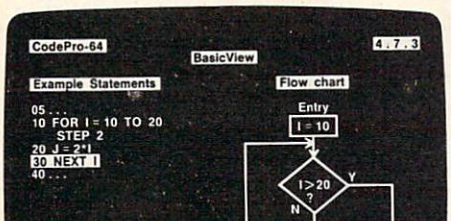
SEE PROGRAM EXECUTION

Imagine actually seeing BASIC statements execute. CodePro-64 guides you through structured examples of BASIC program segments. You enter the requested data or let CodePro-64 do the typing for you. (It will not let you make a mistake.)

After entering an example you invoke our exclusive **BasicView™** which **shows you how the BASIC program example executes.**

You step through and actually see the execution of sample program statements by simply pressing the space bar. CodePro-64 does the rest.

You see statements with corresponding **flow chart graphics** and variable value displays. You learn by visual examples.



EXTENSIVE TUTORIAL

CodePro-64's extensive tutorial guides you through each BASIC command, program statement, and function. You get clear explanations. Then you enter program statements as interactive examples. Where appropriate, you invoke BasicView to see examples execute and watch their flow charts and variables change.

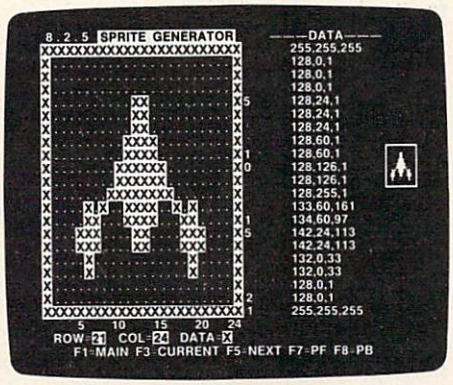
By seeing graphic displays of program segment execution you learn by visual example. You **learn faster and grasp programming concepts easier** with CodePro-64 because you immediately see the results of your input.

You control your learning. You can go through the tutorial sequentially, or return to the main menu and select different topics, or **use keywords** to select language elements to study. You can page back and forth between screens within a topic at the touch of a function key.

CodePro-64 **lets you follow your interests** and practice with interactive examples. But you can never get "lost". F1 will always return you to the main menu. Once you have practiced and mastered the BASIC language elements you move on to more advanced concepts. You learn about sprite and music programming.

SPRITE GENERATOR & DEMONSTRATOR

CodePro-64's sprite generator lets you **define your own sprites** on the screen. You learn how to define sprites and what data values correspond to your sprite definitions. (You can then use these values to write your own programs.) You can **easily experiment** with different definitions and make changes to immediately see the effects.



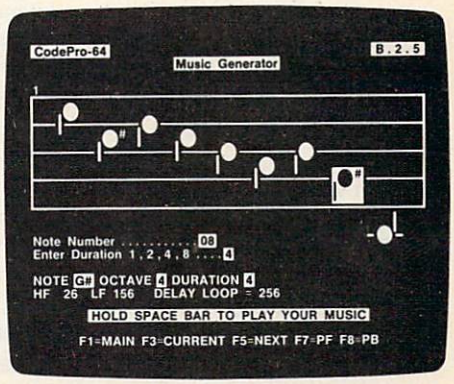
We also help you learn to program with sprites by giving you a **sprite demonstrator** so you can see the effect of changing register values. You can experiment by moving your sprite around in a screen segment, change its color or priority, and see the effects of your changes. You learn by visual examples.

MUSIC GENERATOR & DEMONSTRATOR

To teach you music programming CodePro-64 gives you an interactive music generator and demonstrator. First we help you set all your SID parameters (attack/decay, sustain/release, waveform, etc.). Then you enter notes to play and **we show your tune graphically as it plays,** note by note, on the scale. You learn by seeing and hearing the results of your input.

OUR GUARANTEE

We guarantee your satisfaction. You must be satisfied with CodePro-64 for the Commodore-64. Try it for 10 days and if for any reason you are not satisfied return it to us (undamaged) for a full refund. **No risk.**


CodePro-64
Music Generator
B.2.5
Note Number 08
Enter Duration 1,2,4,8 . . . 4
NOTE G# OCTAVE 4 DURATION 4
HF 26 LF 156 DELAY LOOP = 256
HOLD SPACE BAR TO PLAY YOUR MUSIC
F1=MAIN F3=CURRENT F5=NEXT F7=PF F8=PB

Our music demonstrator **lets you experiment** with various combinations of music programming parameters and hear the results. You can **quickly modify any of the SID register values** to hear the effects of the change. For example, you could easily change waveform and attack/decay values while holding all other SID values constant. By seeing your input and hearing the result you quickly learn how to create new musical sounds and special sound effects.

AND MORE . . .

We don't have enough space to tell you everything CodePro-64 offers. You need to see for yourself. BASIC tutorials, graphics, sprites, music, keyboard review, sample programs—the main menu shown above gives you just a summary of the contents of this powerful educational product.

Whether you're a beginning programmer or an experienced professional, CodePro-64 will help you improve your Commodore 64 programming skills. We're sure because CodePro-64 was developed by a team of two professionals with **over 25 years** of software development experience.

CodePro-64 is a professional quality educational program for the serious student of personal computing. And it's **fully guaranteed.** Order yours today.

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Dealer inquiries invited.

relay will not actuate. However, when the DTR line is taken low, the relay trips. The contacts will close and they can be used to key the push to talk circuit on the two-way radio. All the parts can be obtained at your friendly Radio Shack store. The transistor can be virtually any NPN silicon device such as the 2N2222. A suitable part is their MPS222A (part number 276-2009). The relay is any 5-volt single pole, single throw type. Their 275-243 relay works quite well. The 1N4001 diode is essential or the "kickback" from the relay will destroy the transistor. I use the RS 276-1101 diode.

The F3 key allows the user to reset the baud rate. Note that all variables are reinitialized if this selection is made. The F5 key is used to insert the call letters of the station you are communicating with. I did not use the F7 key, which will allow the user to customize the program as desired.

The F2, F4, F6 and F8 keys (shifted F1-F7) send the canned messages. F2 sends the station identification. Don't press this key if you have not inserted the call letters of the other station or the program will crash. This can be fixed, if it is bothersome, by inserting another line (55ID$(1)=" "). The F4 key sends the description of the equipment contained in ID$(2). The remaining two keys send "CQ" (a general call requesting a contact with other stations) and U* test signal. This test sends alternate ones and zeros for checking reception distortion. Note that the last two canned messages will be sent over and over until the RETURN key is held down and the program prints to the end of the line. When this is done, the operator will be returned to the tansmit mode. This can occur even before the computer buffer is empty. In other words the buffer contents will continue to be sent until empty. If you tape a few characters after sending the "canned" CQ message, make sure that everything has been sent before switching back to receive. This should be kept in mind, particularly at slower baud rates.

PROGRAM DESCRIPTION

The first active line is 10, where the program branches to the baud rate selection between lines 1500 and 1550. Line 1540 is necessary if one resets the rate. If the line is omitted, a "file open" error will occur. Additional baud rates can be handled by adding more "IFB$=" in this section.

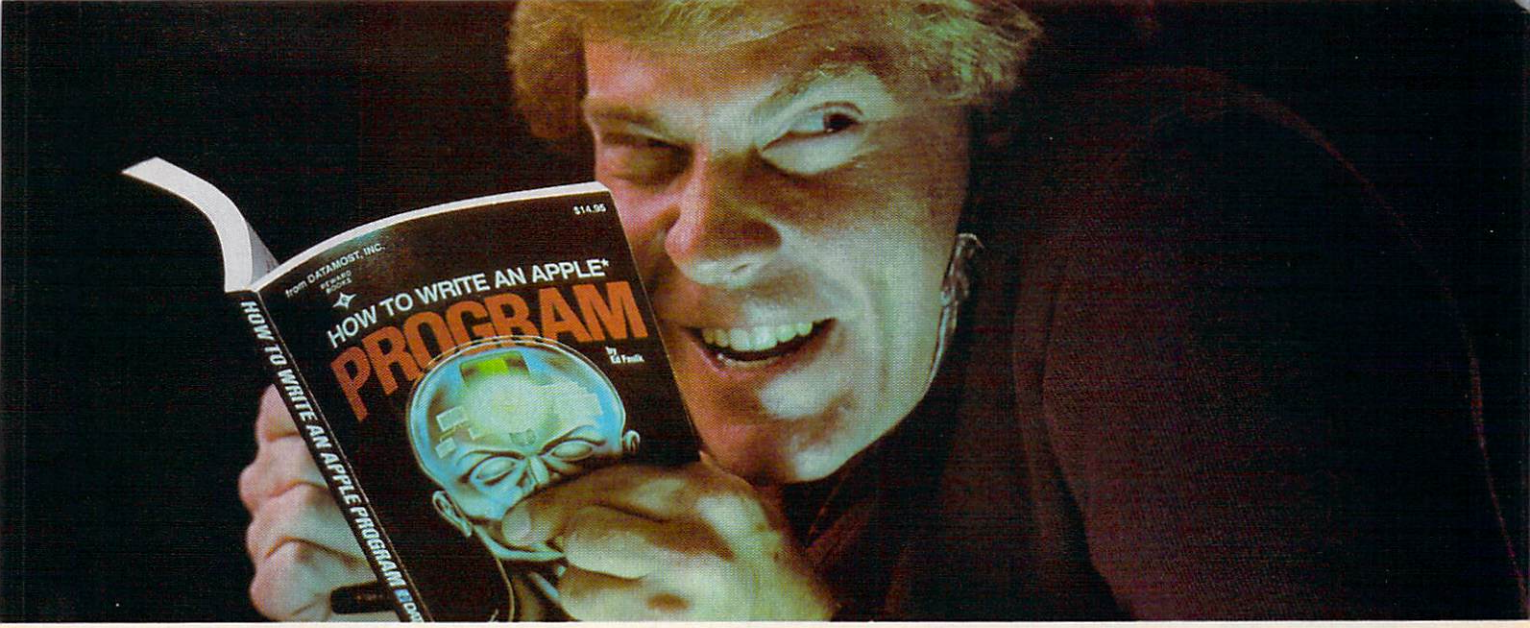
Line 20 assigns C$ to the clear screen code, while K$ is the backspace and erase. A small cursor (CHR$187) is assigned to J$. By replacing the 187, you can make the cursor any character you wish.

Lines 30-50 produce a small header

Figure 1

```
1 REM BY DON STONER W6TNS
2 REM FOR C64 CHANGE 37136 IN LINES 200
AND 300 TO 56577
10 GOTO1500
20 C$=CHR$(147):K$=CHR$(20):J$=CHR$(187):
   PRINTCHR$(14)+C$
30 FORX=1TO22:PRINTCHR$(164);:NEXT
40 PRINT"HAMTERM FOR VIC & C64"
50 FORX=1TO22:PRINTCHR$(163);:NEXT
60 PRINT:PRINT"LOADING DATA...."
70 ID$(2)="RIG IS RAYTHEON RAY40
   CONVERTED TO TWO MTRS COMPUTER
   IS VIC-20"
80 ID$(3)="CQ CQ CQ DE DON, W6TNS
   LOCATED MERCER IS. WA."
90 ID$(4)="U*U*U*U*U*U*U*U*U*U*U*"
100 DIMI%(255),O%(255)
110 FORZ=32TO64:O%(Z)=Z:NEXT:O%(13)=13:
    O%(20)=8:O%(160)=32
120 FORZ=65TO90:Y=Z+32:O%(Z)=Y:NEXT:
    FORZ=91TO95:O%(Z)=Z:NEXT
130 FORZ=193TO218:Y=Z-128:O%(Z)=Y:NEXT
140 FORZ=0TO255:Y=O%(Z):IFY<>0THENI%(Y)=Z
150 NEXT
200 POKE37136,100:PRINTCHR$(147)+"RX":
    PRINTJ$;
205 GETA$:IFA$=CHR$(133)THEN300
210 GET#2,A$:IFA$=""THEN205
220 A=I%(ASC(A$)):PRINTK$+CHR$(A)+J$;:
    IFA=34THENPOKE212,0
230 GOTO210
300 POKE37136,96:PRINTC$+"TX":PRINTJ$;
310 GETA$:IFA$=""THEN310
320 IFA$=CHR$(133)GOTO200
330 IFA$=CHR$(134)GOTO1500
340 IFA$=CHR$(135)GOTO900
360 IFA$=CHR$(137)THENS=1:GOTO800
370 IFA$=CHR$(138)THENS=2:GOTO800
380 IFA$=CHR$(139)THENS=3:GOTO800
390 IFA$=CHR$(140)THENS=4:GOTO800
400 PRINTK$+A$+J$;:PRINT#2,CHR$
    (O%(ASC(A$)));:GOTO310
800 FORX=1TOLEN(ID$(S))
810 T$=MID$(ID$(S),X,1)
820 PRINTT$;:PRINT#2,CHR$(O%(ASC(T$)));
830 NEXT:PRINTCHR$(13):PRINT#2,CHR$(13)
840 IFS<3GOTO300
860 IFPEEK(203)<>64GOTO300
870 GOTO800
900 PRINT"ENTER CALL":INPUTCA$
910 ID$(1)=CA$+" DE DON, W6TNS":GOTO300
1500 PRINTCHR$(147):PRINT"ENTER BAUD
     RATE":INPUTB$:IFB$=""THEN1500
1510 IFB$="110"THENB=3
1520 IFB$="300"THENB=6
1530 IFB$="1200"THENB=8
1540 CLOSE2
1550 OPEN2,2,3,CHR$(B):GOTO20
```


Continued on page 33



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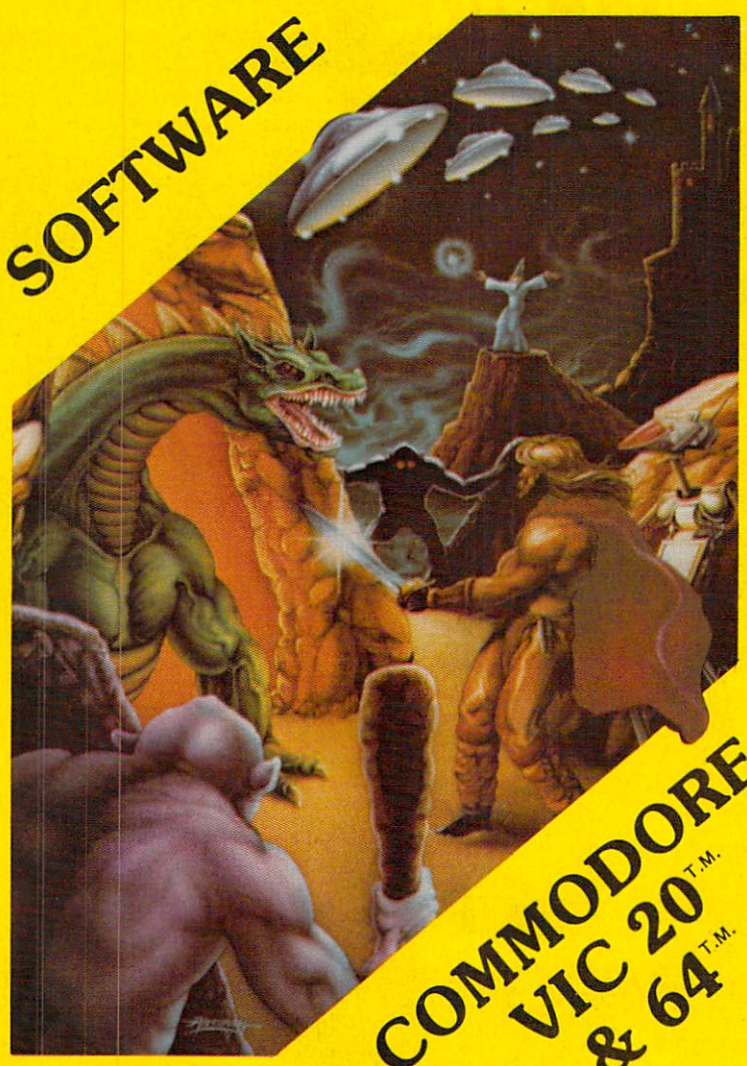

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COMMAND POST

By Jim Grubbs

Using your VIC-20 or C-64 as an amateur radio communications terminal requires two major additions to your computer equipment. You must have some kind of interface between the computer and your amateur equipment. This can be as simple as the interface previously published in COMMAND POST, or very sophisticated hardware costing hundreds of dollars. All the interfaces in the world, though, don't do much good without software. Preferably the software you select will have the capability to send and receive all standard speeds of amateur radio teletype (RTTY), Morse code, and with this being the computer age, ASCII transmission and reception are desirable. Additional features might include the ability to copy "commercial" or "press" transmissions on teletype at speeds not normally used by amateurs. If all of this can then be made menu selectable, you have quite a versatile piece of software! This month we take a look at several examples of the best.

HAM TEXT– IT'S NOT PIG LATIN

Two such software packages are offered by Kantronics. Kantronics has led the way in developing quality amateur communications programs for the Commodore line. Hamsoft, and now Hamtext provide all of the features we have outlined. One has only to find an on-the-air example of what Hamsoft or Hamtext sounds like. What you can't hear or see is how it performs on receive.

Looking at each mode individually, Hamsoft and Hamtext will both send and receive Morse at 5 to 99 words per minute. Hearing code at 99 words per minute is certainly a thrill, but the novelty soon wears off. The point that should be noted is that over the entire range the code is "machine perfect"–no need to concern yourself with "weighting" or "spacing" problems. These packages do an equally good job at receiving code over this range. An interesting feature includes display of not only the sending speed, but also the speed of the station you are receiving. Receive speed adjustment is totally automatic! Believe me it really does work. I tuned in to the W1AW code practice sessions and bulletins and watched the speed track exactly as advertised. There isn't much else to say about the receive portion other than it works extremely well. As others have pointed out, computers certainly show a lot of the sloppy sending to be found on the bands. If someone is sending CQ (calling all stations) and when sending the C sends dahdit (space) dahdit rather than dahdit-dahdit, Hamsoft will print NN rather than a C–just doing what it was told!

On the send side the same speed range is available. Transmit speed can only be changed while in the receive mode, which can be a minor inconvenience. This is one CW program you are not likely to type too fast for, as there is a 1024 character buffer available. Split screen operation allows you to compose an outgoing message while receiving. "Canned" or preprogrammed messages can be sent by themselves or intermixed with regular text.

Hamsoft will also allow you to use either a Centronics parallel printer or one of the standard Commodore printers such as the 1525. You can turn the printer on and off with one of the special function keys. There is a 12 page instruction booklet included and the necessary cord to connect the Kantronics interface to the joystick port on your VIC-20 or C-64. Although operation with other interfaces is not guaranteed, information is provided on interfacing to homebuilt and other manufacturers' equipment. For the most part this is not necessary since the other leaders recognize the popularity of the Kantronics software and provide direct connections to the supplied cord.

The Hamsoft package performs equally well on RTTY and ASCII. The same split screen, transmit buffer and programmed messages are available. Additionally the unshift on space option (USOS) is available and can be a real help when copying a signal under adverse conditions. In standard RTTY only a limited number of characters are available. All letters are sent as uppercase, and numbers and special characters are shifted characters. So what happens if you send K9EI and just as the signal is sent to shift back to letters after the 9 a static crash wipes out that signal? The result is the proper characters being decoded, but printing wrong since the receive unit still thinks it should be in the "figures" or shifted mode. The USOS feature insures that when a space is received the unit is shifted back to the letters mode.

I found that both the RTTY and ASCII modes did an admirable job, just as the CW portion had. There is provision for an automatic CW ID when using RTTY and ASCII. Incidentally, there is a built-in 24 hour clock displayed. This is also used to time your transmissions in order to know when to insert the CW ID. You can hear RTTY and ASCII sidetone through your monitor just as you hear a CW sidetone in the Morse mode. Standard RTTY speeds of 60, 67, 75, and 100 wpm are supported as well as 110 and 300 baud ASCII. Those of us accustomed to old 60 wpm RTTY are awed by the seemingly fast 300 baud ASCII, even though computer types consider 300 baud ASCII almost antique! Incidentally, the only ASCII transmissions I found on a regular basis were the W1AW bulletins. They follow the regular RTTY transmissions and are sent at 110 baud.

Both Hamsoft and Hamtext give you the ability to create 10 "message ports". These can include your CQ message, an RY test message for RTTY (or U* test message for ASCII), a brag message (information about yourself and your station), or anything else you wish. Any of the 10 messages can be used in any or all of the modes available. Since your messages are normally lost when you turn off your VIC or C-64, you have the option of saving your message ports to cassette or disk and loading them back in next time you need them.

HAMTEXT–AMATEUR RADIO WORD PROCESSING

Hamtext gives you all of this and more. The name is well chosen, for Hamtext is sort of a cross between a communications program and a simple word processor. Together the combination is really something. Hamtext comes with a 36 page instruction manual in a very nice binder. On page one it suggests you read the entire book before attempting to use the program. DO IT! I am not usually intimidated by either machinery or software, but the features available here at first seem somewhat overwhelming. The manual is written very clearly though and after fumbling around for an hour or so the features become clear.

When using Hamtext you have the ability to store into memory everything that you send and receive up to the limits of the available memory. Once in memory you can use the simplified text editor (STE) to edit the text, just as you would with a simple word processing package. Additionally you can do text transmission directly from disk or tape! Consider these possibilities: Did you ever have to copy a W1AW or a DX bulletin and later re-transmit to someone? With Hamtext, no problem . . . just turn on the "recorder" and later save it to tape or disk. Edit it if you wish and it is ready to transmit on your command! This has obvious implications for the serious traffic handler since messages can be edited and stored for later transmission. It also can be used by computer hobbyists. Program listings are really no more than regular text, therefore over the air transmission of programs becomes a very real possibility. In the months ahead we will explore how this can be done, but it is much like uploading and downloading a program to your local BBS.

An additional feature is "keybeep" if you want it (audible click in your monitor whenever you press a key). Both software packages now come in a plastic cartridge. Early models were not so enclosed. If you happen to have an early model, contact Kantronics about arranging an appointment to have your software encased. The programs go into the expansion port just like a game cartridge or the VICMON cartridge. No additional memory is required for either package; however, with Hamtext in particular, additional memory will allow you to store more information in the holding buffer. In order to use both Hamtext and a memory expansion cartridge with your VIC you will have to have a multiple slot expansion board. In order to run Hamsoft or Hamtext you must use the SYS command. This is a recent change so that the user can call the program from BASIC. Older versions included the "auto run" sequence, the current models do not. Hamsoft retails for $49.95. Hamtext is priced at $89.95. The choice should probably be centered around your interest in using the extended message and re-transmission features. Both packages are excellent values and carry a 90-day warranty.

AEA-MBA #001

Looks like alphabet soup doesn't it? AEA is Advanced Electronic Applications of Lynnwood, Washington. MBA is Morse, Baudot, ASCII! The #001 means that yours truly got to test drive the new AEA MBATEST software package serial number one. It's a bit of the thrill of flying an experimental aircraft with almost none of the danger.

When I was a youngster, Dad drove a Chevrolet. He always wanted just once to own an Oldsmobile. That day finally came in 1959. I would liken using the AEA MBATEST package to that of driving an Oldsmobile after many years of driving a Chevrolet . . . it feels great!

The MBATEST package release has been anticipated for some time. AEA has already achieved a high standard for interfaces with their CP-1 computer patch, which we will review later. The wait has been worth it.

The overall "appearance" of MBATEXT is not dissimilar to the Kantronics Hamtext package. There are several noteworthy features that the guys at AEA have included that make it a really slick package.

Rather than repeat all of the features already mentioned for Hamtext, suffice it to say that MBATEXT does all of those for starters! Operation and menu selection of modes and features is similar.

The additional features include a CW "break in" mode. If selected, this mode allows you to begin transmitting simply by typing characters on the keyboard without manually having to switch to transmit. What is sacrificed is the ability to type into a holding buffer while receiving, since in this mode there is no holding buffer. If you can type faster than the code is being sent, you can of course backspace to correct errors. Therein lies the only fault I could find with MBATEXT and it is one of documentation, not software. I kept trying to correct text while transmitting by using the "delete" key or the CRSR (cursor) key. It didn't work! I reread the 16 page instruction manual and although it is very clear and specifically mentions correcting typing mistakes it didn't tell me how to do it. At first I suspected a programming oversight, but applying a bit of "programmer's logic" I gave it one more try using the "backarrow" key located in the upper left hand corner of the keyboard . . . it worked, and it even makes sense when you think about it. I also found it a bit inconvenient to have to go back to the options menu to turn the break-in feature on and off. Direct control while in the Morse mode would be nice.

MBATEXT also offers an output mode option. Normally characters are sent as they are typed or appear in the buffer. This is the character mode. In the word mode, MBATEXT holds up transmission of a group of characters until a space is encountered. If you are a ten thumbs typist this will let you correct your mistakes before you send them. You can select a Morse fill option that is the CW equivalent to RTTY "diddle". On RTTY, when no characters are being sent there is normally a steady tone heard. "Diddle"

transmits a null character when nothing is being sent. This serves a purpose on RTTY by continually giving the receive station a shifted signal to lock to. The Morse fill option in MBATEXT transmits a BT sign while the operator tries to think of something to say. This is an interesting option, but personally I hope it will see only limited use. With all the options available for preparing your text while receiving, I think even the slowest thinkers could come up with something.

For those operating at slower speeds, AEA has adjusted the transmitting portion of the program to use Farnsworth spacing. That is, for speeds from 5 to 14 wpm the characters are sent at 15 wpm while the spaces between characters are lengthened to yield an overall rate equal to the selected speed. This is exactly the method used on W1AW code practice transmissions. Finally, while in the CW receive mode it is possible to override the automatic speed tracking. This can be handy when trying to copy a very weak signal or one covered with interference.

The RTTY mode has some additions as well. A 132 wpm speed has been added to the standard 60, 67, 75, and 100 wpm speeds. What could truly be a nice option, particularly for the beginner to RTTY, is a speed guess mode. By pressing one of the special function keys, MBATEXT will evaluate the incoming data rate and take a guess at the speed of the transmitting RTTY station. It takes the average of several guesses to get in the ball park. I found that this worked marginally well, though I frequently came up with a "best guess" of 67 wpm when the station was actually transmitting at 60.

AEA is also offering a one year software support arrangement with MBATEXT. The agreement is even transferable should you for some unknown reason decide you want to sell the software cartridge to someone else before the year is up. MBATEXT loads like a game cartridge and requires a SYS command to make it active.

AEA is offering some special prices on MBATEXT for the VIC and 64. If purchased separately it retails for $89.95. If bought with the CP-1 interface the total package cost is $239.95. Incidentally Dad is driving a Chevrolet again these days.

INTERFACING, OR I'M OK WITH MFJ

MFJ offers a very reasonably priced interface that is completely compatible with the Kantronics software, and although I didn't get the chance to try it, it should work equally well with MBATEXT by AEA. At a list price of $99.95 the MFJ-1224 is sure to get a lot of attention.

MFJ has thoughtfully provided a connector designed to mate with the one supplied with Hamsoft and Hamtext. It also comes with full interfacing information so that you should be able to figure out how to make it work in just about any situation.

The 1224 requires external power. My review unit was supplied with the optional MFJ-1312 power unit which retails for $9.95.

There is a RTTY and CW selection switch that places active filters "in line" to insure better CW reception. In the RTTY position with the unit set for 850 hertz shift the active filters are bypassed. In the other RTTY shifts, varying degrees of filtering are done.

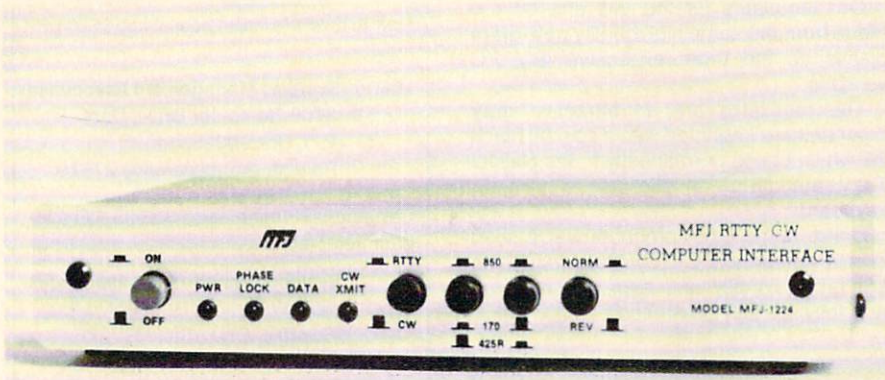
The MFJ-1224 is designed specifically to copy virtually all the different shifts commonly used with RTTY. A combination of two push button switches is used to select 170, 425, or 850 hertz shift. In addition, a normal/reverse switch is provided to allow you to compensate for stations sending with their mark and space tones reversed. A neat feature is that since most commercial stations use 425 hertz reverse shift, when you set the switches for that mode the 1224 automatically switches from normal to reverse shift for you. On transmit, 170 and 850 hertz shift tones are available depending on how the switches are set. Even the AEA CP-1 has only 170 hertz tones available.

A RTTY loop output is included in case you would still like to make your old model 15 teleprinter copy along. Since no speed conversion is done in the 1224 you will only be able to use your old teletype for the speed it was originally designed for.

Electronically the MFJ-1224 uses a couple of EXAR integrated circuits. The XR2211 is a single chip FSK demodulator while the XR2206 is used for transmit. It is actually a function generator chip. Automatic noise limiting is incorporated into the circuitry, and when in the 170 hertz mode an 8 pole active filter is inline. MFJ was a pioneer in active audio filter products and knows what they are doing in this area. Construction of the unit is solid.

Two LED indicators are used for aid in tuning in signals. I found tuning a bit difficult, but soon got accustomed to the best combination of flashing lights for best copy.

The shift switches on the MFJ-1224 didn't seem to help as much on commercial RTTY as I had hoped they would. All in all, I found the MFJ-1224 to be an excellent dollar value and a good interface for those who want to get their feet wet in RTTY with the additional features of CW and ASCII and a minimal cost. For those interested only in reception a special version is available. The MFJ-1225 lists at $69.95.

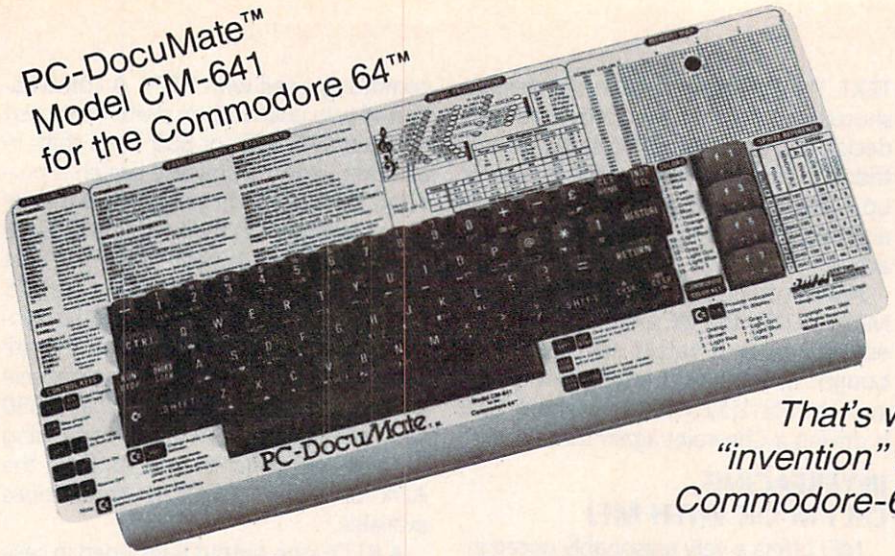


1. The MFJ-1224 Computer Interface

THE OLD CLOCK ON THE WALL

The block counter on my word processor tells me I've exceeded my space for this month. Still to come, the AEA CP-1 Computer patch, the Kantronics Interface and a lot more.

My best wishes to each one of you for a wonderful holiday season. HAPPY BIRTHDAY AND MERRY CHRISTMAS TO *COMMANDER!* □



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INCONVENIENT MANUALS

The user's guide was a nuisance and the programmer's reference manual was just plain inconvenient to use. We found the control key combinations confusing and the introduction to BASIC to be too "basic" for our needs. We needed a simple solution to our documentation problems.

So we decided to surround the keyboard of each PC with the information we wanted. We decided to print whatever we needed on sturdy **plastic templates** which would fit the keyboard of either the VIC-20 or Commodore 64.

SIMPLE SOLUTION

This was the simple solution to our problem. Now we could have the essential information right at our fingertips.

On the left side and top of the templates we put **BASIC** functions, commands, and statements. On the lower left we used **key symbols** to remind us of how to use SHIFT, RUN/STOP, CTRL and the "Commodore" key. Over on the bottom right side we put some additional keys to help remember about CLR/HOME and RESTORE. But we were still a little confused.

STILL CONFUSED

We found we were confused about music programming, color graphics, and sprites. On both the VIC-20 and the CBM-64 templates we carefully organized and summarized the essential reference data for **music** programming and put it across the top—showing notes and the scale. All those values you must POKE and where to POKE them are listed.

Then to clarify **color graphics** we laid out screen memory maps showing character and color addresses in a screen matrix. (We got this idea from the manuals.)

For the VIC-20 we added a complete memory address map for documenting where everything is in an expanded or unexpanded VIC.

For the Commodore 64 we came up with a really clever summary table for showing almost everything you ever need to know for **sprite** graphics.

GETTING EASIER

Now we had organized the most essential information for our VIC and 64 in the most logical way. BASIC, music, color graphics, and sprites all seemed a lot easier. Our initial problem was solved by PC-DocuMate™.

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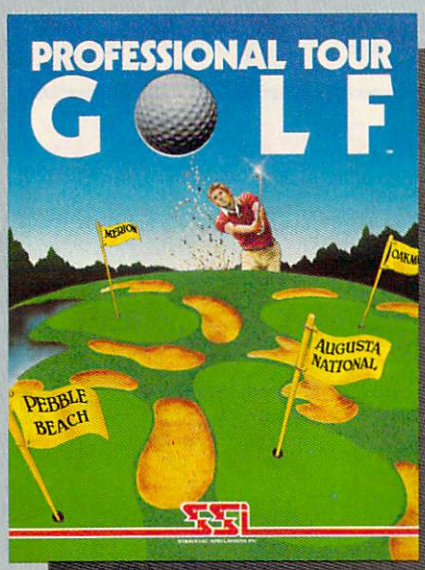

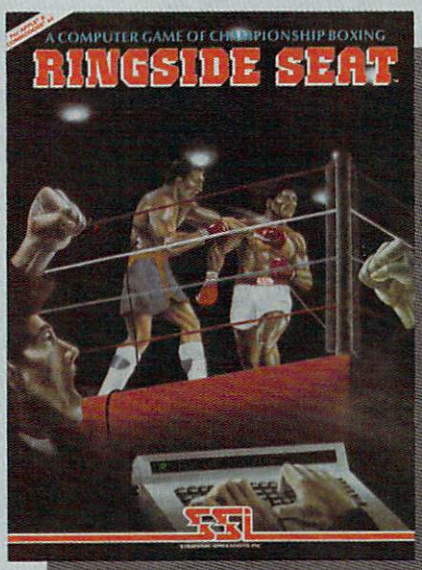

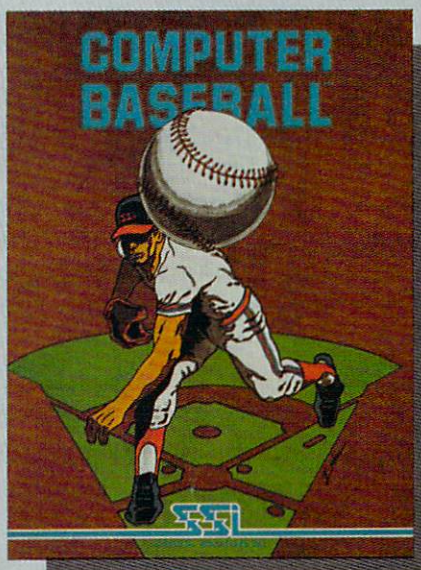

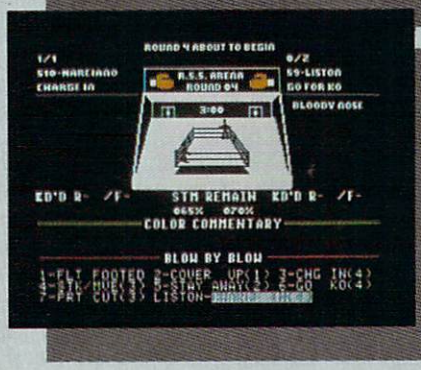

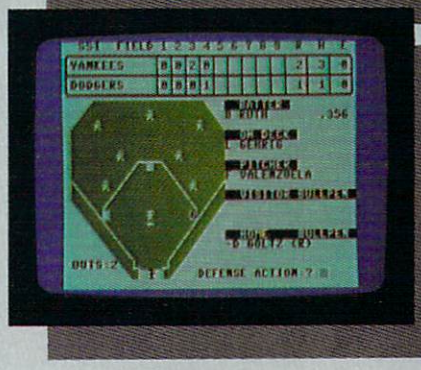

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Continued from page 22

VIC 20™ COMMODORE 64™

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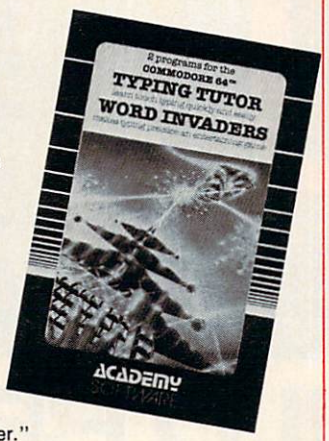

Rated **THE BEST** educational program for the VIC 20™ by ***Creative Computing*** magazine.

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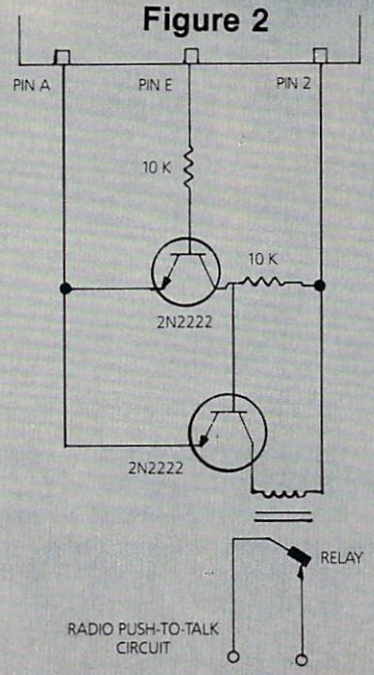
Circle No. 2

Figure 2



Relay Driver for Radio

with the program name. Line 60 is a pacifier message while waiting for the program to initialize.

The "cannned" messages are found in lines 70-90 and should be modified to suit the user.

Lines 100-150 build the table for translation between ASCII and Commodore characters.

The POKE in line 200 insures that the DTR line is high during receive mode. I just noticed that replacing the PRINTCHR$-(147) with a PRINTC$ will save a couple of bytes of memory. Line 205 checks the keyboard to see if the F1 key is pressed. If it is, the program branches to the transmit section. At 210 the program checks the input to see if there is a character and line 220 prints it on the screen.

The POKE in line 300 takes the DTR line low and energizes the relay as mentioned earlier. Line 310 waits for a keyboard input. When one occurs, lines 320-390 check to see if one of the function keys is depressed. The F1 key is CHR$(133). If this key is pressed, the program will return to the receive mode. If a "canned" is to be sent, the program branches to line 800. The ASCII character is printed on the screen and sent out to the terminal unit by line 400.

Line 800 and 810 disassemble the string with the individual character represented by T$. This is printed on the screen and transmitted by line 820. Line 830 sends a carriage return at the end of the string.

If the ID or equipment string is being transmitted, line 840 insures that it is only sent once. The CQ and test string are sent over and over until the RETURN key is pressed, as detected by line 860.

The call of the other station is entered in line 900 and is merged with the user's call in line 910.

The program can be modified by the reader to suit a number of applications. I use it regularly in the form shown and enjoy its simple operation.

Until next month, keep on telecomputing es 73 de Don, W6TNS. □

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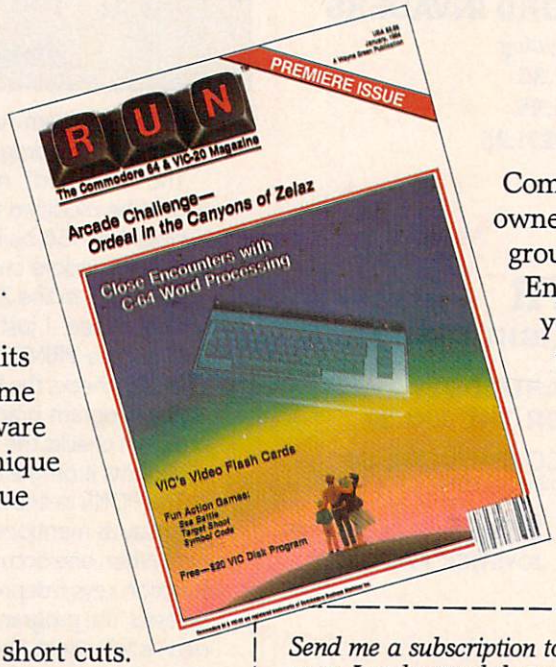

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73DFCM

A Christmas Poem

By Ian & Linda Adam

'Twas the night before Christmas
when all through the house
Not a disk drive was whirring,
nor even a mouse;

The monitor was warmed up,
all tuned in with care,
In hopes that St. Commodore
soon would be there;

The children were nestled
all snug in their beds,
While visions of Jumpman
danced in their heads;

And Mamma in her 'kerchief,
and I in my 'jams
Had just settled our brains
to write some programs;

When out on the lawn
there arose such a clatter,
I sprang from the keyboard
to see what was the matter.

When, what to my wondering
eyes should appear,
But a chip-laden sleigh, and
eight tiny reindeer.

As I drew in my head,
and was turning around,
Down the chimney St. Commodore
came with a bound.

A wink of his eye
and a twist of his head,
Soon gave me to think
what he meant when he said:

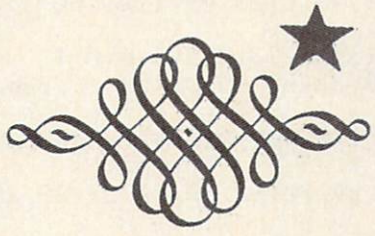
"Just type in this program,
Please give it a try;
And after it's run,
then you'll know why."

He spoke no more words,
but went straight to his tasks,
And fill'd all the stockings
with wonderful disks

Of Frogger, Grid Runner
Spreadsheets and Word Pro's
Then giving a nod,
up the user port he rose;

He sprang to his sleigh,
said RETURN to his team
And away they all flew
like a laser-disc beam.

But I heard him exclaim,
ere he drove out of sight
"Happy Computing to all,
and to all a good night!"



Continued on page 36

Continued from page 35

XMAS-CARD

C-64 Stocking

```
1 REM DEC 1983 FOR C-64
2 REM COPYRIGHT (C) 1983
3 REM BY DONALD ELMAN
10 POKE 53280,0:POKE53281,0:PRINT CHR$(
   147)
20 FOR I=1 TO 5:PRINT CHR$(17);:NEXT I
30 PRINT CHR$(30);
40 FOR I = 0 TO 17
50 PRINT TAB(20-I);
60 FOR J = 1 TO 2*I+1
70 PRINT CHR$(42);:NEXT J:PRINT
80 FOR T = 1 TO 500:NEXT T:NEXT I
90 FOR I=1 TO 3:PRINT TAB(20)CHR$(28);C
   HR$(18);CHR$(32);CHR$(146)
100 NEXT I:GOSUB 1000:PRINT CHR$(19)
110 FOR I=1 TO 10
120 PRINT CHR$(17);:NEXT I
130 FOR I=1 TO 4
140 PRINT TAB(16)
150 FOR J = 1 TO 11:READ C
160 PRINT CHR$(C);:NEXT J:PRINT
170 FOR T = 1 TO 1000: NEXT T: NEXT I
180 RESTORE: GOSUB 1000:END
190 PRINT CHR$(17);CHR$(144)
1000 SL=54272:SH=SL+1:POKESL+24,15
1005 POKESL+5,9:POKESL+6,0
1010 FOR L=1 TO 4:READ N
1020 FOR I=1 TO N:READ TH, TL, D
1030 POKE SH,TH:POKE SL,TL:POKESL+4,33
1040 FOR T=1 TO D*150:NEXT:POKESL+4,33
1050 POKE SL+4,32:FOR T=1 TO 15:NEXT
1060 NEXT I:NEXT L:RETURN
2000 DATA 9,25,30,2,33,135,2,33,135,1,3
   7,162,1
2005 DATA 33,135,1,31,165,1,28,49,2,28,
   49,1,0,0,1
2010 DATA 9,28,49,2,37,162,2,37,162,1,4
   2,62,1
2015 DATA 37,162,1,33,135,1,31,165,2,25
   ,30,1,0,0,1
2020 DATA 9,25,30,2,42,62,2,42,62,1,44,
   193,1
2025 DATA 42,62,1,37,162,1,33,135,2,44,
   193,4,0,0,4
2030 DATA 7,28,49,1,28,49,1,25,30,2,33,
   135,2
2035 DATA 31,165,2,33,135,3,0,0,1
2040 DATA28,29,83,69,65,83,79,78,83,29,
   29
2050 DATA154,71,82,69,69,84,73,78,71,83
   ,29
2060 DATA5,29,29,70,82,79,77,29,29,29,2
   9
2070 DATA28,67,79,77,77,31,65,78,68,69,
   82
```

VIC-20 Stocking

```
1 REM DEC 1983 FOR VIC-20
2 REM COPYRIGHT (C) 1983
3 REM BY DONALD ELMAN
10 POKE 36879,8:PRINTCHR$(147)
20 FOR I=1 TO 5:PRINT CHR$(17);:NEXT I
30 PRINT CHR$(30);
40 FOR I = 0 TO 10
50 PRINT TAB(11-I);
60 FOR J = 1 TO 2*I+1
70 PRINT CHR$(42);:NEXT J:PRINT
80 FOR T = 1 TO 500:NEXT T:NEXT I
90 FOR I=1 TO 3:PRINT TAB(11)CHR$(28);C
   HR$(18);CHR$(32);CHR$(146)
100 NEXT I:GOSUB 1000:PRINT CHR$(19)
110 FOR I=1 TO 10
120 PRINT CHR$(17);:NEXT I
130 FOR I=1 TO 4
140 PRINT TAB(7);
150 FOR J = 1 TO 11:READ C
160 PRINT CHR$(C);:NEXT J:PRINT
170 FOR T = 1 TO 1000: NEXT T: NEXT I
180 RESTORE: GOSUB 1000
190 PRINT CHR$(17);CHR$(144)
1000 V=36878:S1=36874:S3=36876
1010 FOR L=1 TO 4:READ N
1020 FOR I=1 TO N:READ TN, D
1030 POKES1,TN:POKE S3,TN:POKEV,15
1040 FOR T=1 TO D*150:NEXT
1050 POKE V,0:FOR T=1 TO 15:NEXT
1060 NEXT I:NEXT L:RETURN
2000 DATA9,215,2,225,2,225,1,228,1,225,
   1,223,1,219,2,219,1,0,1
2010 DATA9,219,2,228,2,228,1,231,1,228,
   1,225,1,223,2,215,1,0,1
2020 DATA9,215,2,231,2,231,1,232,1,231,
   1,228,1,225,2,232,4,0,4
2030 DATA7,219,1,219,1,215,2,225,2,223,
   2,225,3,0,1
2040 DATA28,29,83,69,65,83,79,78,83,29,
   29
2050 DATA154,71,82,69,69,84,73,78,71,83
   ,29
2060 DATA5,29,29,70,82,79,77,29,29,29,2
   9
2070 DATA28,67,79,77,77,31,65,78,68,69,
   82
```

28, 68, 69, 66, 38, 31, 83, 65, 78, 84, 65

Continued from page 14

TITLE: FACEMAKER

FORMAT: Cartridge
PRICE: $34.95
AUDIENCE: Ages 4-12
SUMMARY: Introductory program that allows the creation and animation of cartoon type faces.
MODEL/SOURCE:
COMMODORE 64
SPINNAKER SOFTWARE
215 First Street
Cambridge, MA 02142
VIC-20
HES
Human Engineered Software
71 Park Lane
Brisbane, CA 94005
(415) 468-4110

Everyone has sat with a piece of paper and found himself doodling away and creating faces. First you create a funny nose, then later add some ears, then comes the outlandish hair. FACEMAKER allows a youngster to create funny cartoon-type faces using the computer. FACEMAKER contains three selections in the menu: build, program and game.

Face Building

After loading the program, the first procedure is to build the face. The child is presented with a blank oval shape and is given a choice of five features: mouth, eyes, ears, nose and hair. After choosing one of the features there are six different variations of the feature. A total of thirty different comical faces can be built.

Program Animation

Once the child is satisfied with the face, the fun begins. If he or she decides to choose programming the face, the computer will animate the face on command. The face will wink, smile, wiggle its ears, frown, cry, or stick out its tongue when the proper letters are entered on the keyboard. I must admit that my favorite is the tongue. There is something hilarious about a funny face on the computer that sticks out its tongue accompanied by a weird sound.

Memory Game

The third menu selection is GAME.

During GAME the computer animates the face and the player is asked to mimic the action using keyboard responses. The computer starts with one action and adds one action each time the player enters the correct sequence. A high score is displayed on the screen.

Learning Experienced

FACEMAKER is a very good way for young children to learn how to use the computer. During the BUILD segment, with the help of the instruction booklet accompanying the cartridge, the player is introduced to basic computer fundamentals. The program uses concrete examples for introducing terms, such as menu, that even a young child can readily understand. The PROGRAM selection teaches the young person the concept of writing a program in the simplest form. The child enters a sequence of instructions and the computer carries out his instructions in the proper sequence. The GAME selection is an interesting way for children to practice memory and concentration while using the computer. Since each action has both a visual and sound stimulus, the GAME section would be particularly useful for children who have difficulties with visual and auditory conceptualization.

I feel that FACEMAKER is very well done. The graphics and color used in the face are simple but effective. The white screen background is not cluttered; therefore, young children will be able to focus their attention on the face and easily observe the result of their interaction with the computer. The sounds used are an added bonus. They are typical computer-type sounds that are guaranteed to amuse and delight while teaching auditory discrimination.

TITLE: KINDERCOMP

FORMAT: Cartridge
PRICE: $29.95
AUDIENCE: Ages 3-8
SUMMARY: Set of early learning programs featuring drawing, letters and numbers.
MODEL/SOURCE:
COMMODORE 64
SPINNAKER SOFTWARE
215 First Street
Cambridge, MA 02142
VIC-20
H E S
Human Engineered Software
71 Park Lane
Brisbane, CA 94005
(415) 468-4110

KINDERCOMP is a real value for your money. It contains six different programs designed to familiarize preschoolers and primary students with the computer while teaching numbers, letters, and reading readiness skills. It was designed by Doug and Judy Davis for their daughter Amy, whom they wanted to have fun at the computer while learning.

The program is menu driven. After loading KINDERCOMP, a title page appears featuring six activities: DRAW PICTURES, SCRIBBLE, NAMES, SEQUENCES, LETTERS and MATCH.

Joystick Drawing

Drawing pictures is accomplished by using the joystick and keyboard. The child uses the joystick to make line drawings. The keyboard may be used for added options such as changing colors and filling enclosed areas. While drawing pictures, children will increase fine motor control and eye-hand coordination. Very young ones will enjoy having the power to draw on the screen while older ones will learn how to create imaginative but recognizable pictures on the computer screen. My only criticism of the DRAW PICTURE selection is that there is no provision for saving the masterpieces that the children create.

Computer Scribbling

What is the first thing an inexperienced adult does when approaching a computer? Usually it is little more than random key pressing. Well, kids are no different. As soon as they can toddle over to the computer they start pressing keys with their sticky little fingers. SCRIBBLE is designed for the joy of randomly pushing a key and then seeing a whole line of the characters appear with musical accompaniment. By using the shift keys and special characters the child can create a screen of designs.

"VIP" Names

The first word that most children learn to recognize is their name. NAMES allows a child to enter his name and after pushing RETURN the name will flash and scroll across, up, and down the screen. After the child has mastered his or her name, the NAMES selection may be used for spelling other short words or messages.

Number Sequencing

SEQUENCE presents three numbers on the screen and asks the child to enter the next number. The child has three chances to enter the correct response before it is displayed by the computer. If the correct response is entered consistently, the level of difficulty increases. After approximately thirty correct responses, the computer switches to sequences involving multiples of two (i.e., 4 6 8 ?). Thus, the computer continues to increase the difficulty as long as consistent correct responses are entered. If the child enters an incorrect response the level of difficulty drops back to an easier level. Each correct response adds a feature to a drawing that is at the

bottom of the screen. After five correct responses, the figure is animated and a short melody is heard.

Lower Case Letters

The LETTERS selection presents lower case letters. A letter appears on the screen. The child enters the correct matching letter from the keyboard. As in SEQUENCES, after five correct responses, there is an animation and the melody from a familiar nursery song is heard. This segment teaches the relationship among upper- and lower-case letters and their location on the keyboard. The screen is completely blank except for the letter that is being presented and the scene that is being built in the lefthand corner.

Multiple Choice

MATCH is a preschooler form of the multiple choice question. Three symbols such as a square, happy face, arrow, heart, etc. are presented in a box in the lefthand corner of the screen. Underneath there are three different rows of three symbols preceded by a number. The child is expected to enter the number of the row that matches the symbols depicted in the box. After five correct responses, the child is again given a positive animated reward. This selection will give the child practice in symbol recognition that is required for reading readiness.

A Real Bargain

KINDERCOMP is an outstanding program for the preschool age group. I feel that it is unsurpassed in the quality and versatility that it offers for the price in one package. I have been recommending the program for other computers for over a year, and have yet to find a youngster or parent who was not enthusiastic with the selection. It has enough variety that children will continue using it long after they have mastered the letter, number and matching skills. The PICTURE DRAWING segment will continue to captivate a youngster's creative imagination after he or she is tired of the other selections. I even know one game-hardened ten-year--old who likes to draw pictures with his little brother's KINDERCOMP.

TITLE: KIDS ON KEYS

FORMAT: Cartridge
PRICE: $29.95
MODEL: COMMODORE 64
AUDIENCE: Ages 3-9
SUMMARY: Game format that teaches keyboard familiarization, first letter phonetic sounds, and beginning reading and spelling.

SOURCE:
SPINNAKER SOFTWARE
215 First Street
Cambridge, MA 02142

KIDS ON KEYS was written by Frieda Lekkerkerker, a teacher and programmer who specializes in the development of learning games for young children. The program is a series of three games designed for children who have some knowledge of the alphabet and are beginning to learn how to read. Each game has four levels of difficulty.

Keyboard Familiarization

Game one is a keyboard game. Letters descend between two horizontal bars on the screen. The object of the game is to type in the matching letter before the letter touches the lower bar on the screen. After twenty letters, a boy descends in a balloon with a word written on it. If the player types the word correctly before the balloon reaches the bottom bar, the balloon goes back up the screen and the boy waves, accompanied by music. Points are given for the number of letters correctly typed and bonus points are given if the word is also typed correctly. The current score is given on the lefthand side of the screen and the high score is displayed on the righthand side of the screen. Successive levels of difficulty increase both the speed of the game and the size of the word.

This game will help children learn to identify letters of the alphabet and to become familiar with the location of letters on the computer keyboard. It will also give them experience in copying short words. There is an element of time involved, so very young children who are just being introduced to the alphabet may become frustrated, whereas older children will enjoy the challenge of playing a real game.

Spelling

During game two there are the same horizontal bars but this time there are falling pictures. For level one the player is expected to type in the first letter of the picture before the picture reaches the bottom of the screen. During levels two through four the pictures fall faster and the player types in the entire word. Each game consists of a series of five pictures picked randomly from a set of approximately forty pictures. The player is given three chances to type the correct response, but the number of points decreases with each chance. During the bonus round only half of the picture is shown. Points are given for correctly identifying the picture.

Game number two will give the child practice in identifying the beginning sounds of words and practice spelling nouns commonly found in primary vocabulary lists. The partial picture will increase a child's ability to discriminate according to detail and visualize a whole when only a part is given.

Sight Reading

The last game presents five pictures with numbers underneath. A word is displayed at the bottom of the screen and the player enters the number of the picture that the word identifies. Game three uses the same words and pictures that are used in game two. Also, as in game two, the player is given points based on three chances to enter the correct response. Each level of difficulty decreases the time allowed to enter the responses.

Game three will help the beginning reader to quickly sight read the words contained in the program's word bank. I would recommend that game three be introduced to the child before game two so that the child can become familiar with the words and corresponding pictures.

The pictures use in the program are very well done and easily recognized by the young child. The use of sound is limited to a pleasant sound for correct responses and a "bong" sound for incorrect responses. There is also a short melody at the end of each game.

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Circle No. 137

SOME OF THE PROGRAMS THAT HAVE MADE THE GRADE

EDUCATION

Algebra I	Apple
Algebra 2	Apple
Algebra 3	Apple
Algebra 4	Apple
ArithmeVic	VIC 20
The Changer	TRS 80
Color Me	Apple
Con*Putation	Apple
	Atari
Counters	TRS 80
Decimals	Apple
	Atari
Fractions	Apple
	Atari
Function Plot	IBM
Games of the U.S.	Apple
The Game Show	
Movies and T.V.	Apple
People, Places, Things	Apple
Gradebook Plus	Apple
History & Geography	Apple
Jesse's Busy Bugs	TRS 80
Little Counter	Apple
Little Speller	Apple
The New Little Speller	Apple
	Atari
LogoMotion	Apple
Math Skills	Apple
Meet the Presidents	Apple
Morse Code Trainer	VIC 20
Perception	Apple
PSAT Voc. Skills	Apple
Portfolio	Apple
Rainbow Forest	TRS 80
Reading Skills	Apple
	Atari
SAT Voc. Skills	Apple
So Big So Small	TRS 80
Spell Master System	Apple
Spell Master #4	Apple
Spell Master #5	Apple
Spell Master #6	Apple
Spell Master #7	Apple
Spell Master #8	Apple
Spell Master/Adult	Apple
Statistics	Apple
The New Step by Step	Apple
Supermap	Apple
Tanjali	TRS 80
The Big Math Attack	Apple
	Atari
Tic Tac Show	
Fun With Facts I	Apple
Touch Typing Tutor	COM-64
	VIC 20
Vic Lemonade	VIC 20
The Visible Computer	Apple
Win With Words I	Apple
Win With Words II	Apple
Word Search	Apple

GAMES/ ENTERTAINMENT

Abuse	Atari
Acey-Deucy	Apple
	Atari
Add-Em Up	VIC 20
Alien Invasion	COM-64
	VIC 20
Alien Panic	COM-64
Antimatter Splatter	VIC 20
Astro Attack	Apple
The Catch	VIC 20
Championship Blackjack	IBM
Chimp Chase	VIC 20
Chomps	IBM
Conglomerates Collide	Apple
Cosmic Combat	Apple
Creature Venture	Apple
Cribbage	COM-64
Cross Country Rallye	Apple
Crossword Magic	Apple
	Atari
Cyborg	Apple
	IBM
Cyclons	COM-64
	VIC 20
Defender on Tri	VIC 20
Eureka	TRS 80
Exterminator	VIC 20
Falcons	Apple
Final Frontier	Apple
Firebird	Apple
Fun 10	IBM
Gold Rush	Apple
Guardian	Apple
Haunted Hill	Atari
Head On	COM-64
	VIC 20
High Orbit	Apple
Horizon V	Apple
The Island Prison	Apple
It's A Living	VIC 20
Juggler	Apple
Keyboard Golf	Apple
Killer Caterpillar	VIC 20
Krazy Kong	VIC 20
L.A. Land Monopoly	Apple
Launch 2031 AD	VIC 20
Laser Blazer	TRS 80
Lazer Maze	Apple
Lazersilk	Apple
Lookahead	Atari
Lunar Pinball	Apple
Mad Painter	VIC 20
Matchmaker 64	COM-64
Match Racer	Atari
Math Football	Atari
Max-Command	Apple
Midnight Malady	Apple
Monster Match	VIC 20
Mummy's Curse	Apple
Neptune	Apple
Paratrooper	VIC 20
Pathfinder	Atari
The Prisoner	Apple
Pollywog	Apple
Racefun	VIC 20
Regilian Worm	TRS 80
Russki Duck	Apple
Snake Out	VIC 20
Space Chase	TRS 80
Space Conquerors	Apple
Spox	TRS 80
Starblaster	Apple
Swordthrust (series)	Apple
3-D Man	COM-64
	VIC 20
Ticker	VIC 20
Trickshot	Apple
Trivia Trek	Atari
Vikman	VIC 20
Volcanoes	Apple
Zenith	Apple

HOME APPLICATIONS

Automaniac	Apple
Computer Artist	VIC 20
Dietician	Apple
Dinner on a Disk	Apple
Drinks on a Disk	Apple
Home Accountant	Apple
	IBM
	TRS 80
Home Budget	TRS 80
Home Budgeter	Apple
Micro Barmate	Apple
Micro Cookbook	Apple
	IBM
OPTIONX	Apple
Roots-M	Apple
Synthy	COM-64

BUSINESS

Accounts Payable	Apple
Accounts Receivable	Apple
General Ledger	Apple
Mailing List	IBM
Payroll	Apple
Retail Sales Management	IBM
Stock Charting	IBM
Timetable	TRS 80

DATA BASE

Condor I	Apple CP/M
Condor III	Apple CP/M
Data Base Manager	IBM
Datadex	Apple
EZ*Telephone	IBM
FCM	Apple
List Master	Apple
PC Mailer	IBM

WORD PROCESSING

Electric Webster	TRS 80
Sensible Speller	Apple
Smithwriter	COM-64
	VIC 20
Wordsmith	Apple

UTILITIES

The Bug	Apple
Bugbyter	Apple
Character Generator	IBM
Cross Reference	IBM
Disk Director	Apple
Faster Master	Apple
Graphic Print Screen	IBM
Hi-Res Multicolor Graphic	VIC 20
The Liberator	Apple
Mach-20	VIC 20
Memory Disk	IBM
Monitor 5	TRS 80
Multi-Disk Catalog	Apple
Multi-RAM	IBM
Peeks 'N Pokes	IBM
Screen Print	VIC 20
Spool	IBM
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*Requires 16K expander for VIC-20. Available on disk or cassette for both the Commodore 64 and VIC-20.

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SOFTSMITH™

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A VERY SPECIAL CHRISTMAS

By Jim Grubbs

Fathers can be difficult people to buy presents for. When I was a youngster of about eight I remember every gift giving event. I always made a trip to the five and ten to buy Dad a new wallet and key case. He won't admit it, but I suspect that to this day, when his wallet or key case wears out, he still can go to his dresser drawer and pull out a brand new one that I gave him 25 years ago.

There was something special about those items. I insisted that we had to have them monogrammed. There was a specialist at the Honolulu airport who did an exquisite job. That made each one of them Dad's. And by golly he smiled and thanked me every time he opened that same size box. Somehow I eventually caught on that it was a bit like getting a new tie every Christmas, and the wallet and key case era came to an end.

Last year, just like each of the intervening 25 since Honolulu, the family tried to decide what to get Dad for Christmas. He spent most of his life involved in communications, but never did take much interest in using his amateur radio license for on-the-air work. Later he taught aerospace science, but it's a bit difficult to find a space shuttle at a price that a family can afford. After some discussion, I was chosen as eldest son to select one of the low-priced home computers. It was agreed that we would keep it simple, both for budget reasons and in case Dad just turned out not to like computers. Little did any of us suspect what Christmas day would bring.

For many reasons that most of you can identify with, the VIC-20 was chosen as the absolute best dollar value, hands down. A Datasette was a necessity, and since both programmers in the family live several hundred miles from home, a BASIC self-paced course was secured. There was still something missing–there were no customized initials on all of this hardware to say "we love you, Dad".

A solution finally appeared and an entire Plan A suddenly became clear. New computers are very nice things but they need software to really come to life. It wasn't too hard to come up with quite a collection of public domain material, and we even added a few programs of our own design. One program will always shine as the special star on this computer tree.

While checking out the programs on the public domain tapes, it occurred to me that "electronic" greeting cards are all the rage these days, playing their little tune when you open them up. Why not a computer Christmas Card?

The night before Christmas and all through the house, computer buzzwords filled the air in hushed tones. Mom and Billieanne put the final touches on wrapping presents, placing the shiny boxes ("what's in that big one?" Dad asked) just so under the tree. Meanwhile, brother Jon, a television engineer, "worked" diligently on "repairing" a used 12 inch black and white television I had brought home for him to fix. (Wanna by some land in Florida?). I carefully placed a small package, a gift wrapped cassette tape, in Dad's stocking.

In the dawn of Christmas morn, all bleary eyed from the early hour, we gathered around the tree. In turn we each opened a present until everything but one stack was gone. It was time for Plan A. First, I handed Dad that small package with the cassette. "That's nice," he said, a bit bewildered since the cassette bore only a cryptic title. Next, Billieanne gave him the Datasette. "Aha, a cassette recorder to go with the tape, but I have a cassette recorder and this one doesn't have a speaker or a microphone and has a very strange cord coming out of the back of it." Another quick diversion, he has to be catching on by now–an entire box of blank cassettes.

Now it was time to find out what was in the big box. We all held our breath, waiting for a reaction. Why is it that when everyone is on pins and needles it takes forever to get a package open? The moment was indeed climactic. I don't think I have ever seen a bigger smile on my father's face!

It took a few minutes to get everything set up, including my "broken" TV Jon had "repaired". When it was ready, Dad was instructed to type LOAD. After about a minute when the READY prompt returned we told him to type RUN. The computer sprang to life with a Christmas tune and the screen lit with an electronic Christmas tree, complete with flashing lights! Finally a message scrolled across the top of the screen, "Merry Christmas Dad, from Mom, Billieanne, Jon and Jimmy. . . ." Plan A was complete, and Dad's VIC had some personalized initials etched in its electronics forever.

You can make it a very special Christmas for someone just as easily. Commodore has done all the hard work, you just have to add the initials. This year, prices on all of the Commodore products are even more attractive. You can put together a completely functional system for under $200 for a VIC-20, or about $300 for a C-64.

Each machine has its own merits. I have both and like each of them for very different reasons. The graphics on the VIC are very clear, but the screen is only 22 characters wide. In my Dad's case, the larger size of the letters is a plus. The 64 looks more like a real computer on the screen, but does not exhibit the same crispness in display, particularly when used with a television set rather than a monitor. There is no need for memory expansion with a 64, whereas the VIC-20 user soon finds the need for some additional bytes.

The options are many, and obviously you can tailor any of the suggested packages to the needs of your special recipient. However, I do strongly suggest that you keep it simple. Not everyone enjoys computers or feels comfortable with them. Besides, half the attraction of buying a basic system is being able to buy add-ons as gifts for birthdays and other special occasions.

In the case of the VIC, additional memory (16K) and a programmer's reference guide are the best additions. Next a printer is recommended. As a person progresses to more complex programming it becomes very frustrating trying to debug a program on the screen! The 1525 printer, recently reduced in price, does a fine job for general printing. Do *not* expect quality suitable for sending a letter to the President, but it will be completely acceptable for most general correspondence. A letter quality machine is a big investment. There are some alternatives as covered in my article, *"VIC Letter Quality Printing On a Budget"* which appeared in the November issue.

The last two major additions I recommend are a 1541 disk drive and/or a color monitor. The joys of a disk drive become readily apparent. The ease and speed of access alone make it a very nice investment. A color monitor is a must for someone who plans to do a lot of graphic work, or loves playing games. The Commodore monitor is one of the best around.

For those interested in the C-64, there is an immediate saving in that no extra memory is needed. Additional graphic capabilities are present, and the potential of the sound chip is amazing. Be forewarned that these features are not all that simple to grasp, and the "user friendly" software to make them easy to use is just now coming on the market. Don't expect your new computer owners to be anything but frustrated with these features unless they are experienced programmers and are good at digging out information, and sometimes even just guessing!

Don't forget all of the obvious extras that make nice stocking stuffers. . . blank tapes, paper for the printer, extra ribbons, a dust cover perhaps, a subscription to *COMMANDER* (I had to get in the commercial!), programmers aid cartridge, specialized software of interest to your giftee. . . The list goes on and on.

For those interested, the Christmas greeting program I referred to earlier is available on tape VØ for the VIC only from the folks at Public Domain Software, 5025 South Rangeline Road, West Milton, Ohio 45383. They offer three collections on either tape or disk for the VIC-20, titled VØ, V1, and V2. For the 64 two sets are offered, C1, and C2. Each set is only $10 and each is well worth the price. Not every program will be of interest–some of them even have bugs in the them, but each set is an excellent collection for the price.

I strongly recommend that you have someone familiar with computers test out all of the hardware and software that you purchased. Software has been known all too often not to load on Christmas morning. Hardware has been known to come out of the box broken. Avoid this possibility by checking it out before Christmas.

It's easy to make it a very special Christmas for someone special in your life. I hope this helps you to put a big smile on

Continued on page 45

BASIC EDUCATION: PROGRAMMING FOR LEARNING

by Andy Van Duyne

Perhaps one of the areas to be most greatly affected by the 'Computer Revolution' is education. The machines offer exciting possibilities that were undreamed of only a few years ago. In the rush to develop software for the educational field, however, several poor quality programs have been produced. The fundamental problem seems to be that-much of the software was written by either:

1. Computer Programmers who didn't know much about teaching.
2. Teachers who didn't know much about Computer Programming.

The aim of this column is to share ideas and techniques to help you write more effective BASIC educational programs for your Commodore computer. To illustrate the concepts and techniques discussed, programs will be included that you can copy and modify. And don't get the idea that if you don't teach in a school you won't find things of value. More and more of your child's education will be occurring right in the home.

The techniques I will share with you have been developed through actual school use and are not from some dusty education theory book. In the several years that I have been writing educational programs, teachers and students in my own and other districts have returned excellent and, when needed, critical feedback as to what works and what doesn't. Believe this–if a way can be found to thwart a program's coding or intention, it will be discovered in about two minutes by the toughest critics you'll find: the kids themselves.

Several installments of BASIC EDUCATION will center on 'kid-proofing' your software so that your innocent four year old won't cause your masterpiece to come crashing to a halt at the second answer. Others will deal with selecting input techniques (the full keyboard, a few selected keys, the space bar, or how about those big buttons on the right side of the VIC and C-64?). We'll also examine reward systems and reaction to input–one of the most important considerations when writing programs for kids. How do you reward right answers, and to what degree? How do you design program reaction so that the result of correct input is more entertaining than that for an incorrect response? Which type of rewards are appropriate–keeping score, making sounds, animation and graphics, or combinations? What considerations should you use when setting up the screen? The organization of the visual display is also a very important consideration when designing children's software.

The first few columns will deal with several commonly used "styles" of educational programs: Drill and Practice, Tutorial, Quiz, and Simulation. Each style has advantages and drawbacks depending on what type of material you are trying to present and what type of experience you wish the child to have.

DRILL AND PRACTICE PROGRAMS

Our discussion of educational program types will start with the most common variety, Drill and Practice. Essentially, a program of this type presents a number of problems based on one (or, at the most, a very few) objectives. The user of the program offers solutions to the problems, which are scored, evaluated, or rewarded according to the accuracy of the response. This is the most common type of educational program, probably because it is the easiest to program. A limited set of parameters can be established by the programmer, and the computer can do the actual formulation of the specific problems–something it can do indefinitely.

Drill and Practice programs have many critics, most of whom believe that simple, one objective programs are a waste of the interactive learning potential of the computer. Often the programs are early attempts by beginning programmers, or those with limited educational experience. They often succumb to two great pitfalls common to early efforts; i.e., either the programmer has such limited ability that the program ends up lifeless and dull, leading to the ultimate boredom and frustration of the student, or, in an effort to really 'liven up' things,

Continued on page 49

Continued from page 43

someone's face. Merry Christmas and Happy Computing in the New Year!

RECOMMENDED SYSTEMS

VIC-20

$200 System
VIC-20 $80
Model 1530 Datasette $60
Used Black and White TV
Introduction to Basic I $25
Public Domain Software $30

$300 System–as above plus:
16K Memory Expansion $50-$75
Programmer's Reference Guide $17
Introduction to Basic II $25

$600 System–as above plus:
1525 Printer $250
Model 1600 Modem $60

$1,000 System–as above plus:
1541 Disk Drive $250
Black and White Monitor $150

$1500 System–as above plus:
Model 1701 Color Monitor $250
Additional memory $50-$75
Expansion Board $30-$150

Commodore 64

$300 System
C-64 $200
Model 1530 Datasette $60
Used Black and White TV
Introduction to Basic I $25
Public Domain Software $20

$600 System–as above plus:
1525 Printer $250
Model 1600 Modem $60
Programmer's Reference Guide $20

$1,000 System–as above plus:
1541 Disk Drive $250
Black and White Monitor $150

$1500 System–as above plus:
Model 1701 Color Monitor $250
Machine Language Monitor $30-$100
Assorted accessories from below

Additional Recommendations:

Subscription to *COMMANDER!*
Programmer's aid cartridge
Additional Software
Dust covers
Tape or Disk Storage unit
Extra tapes or disks
Joystick/paddles

The charts are based on average prices at the time of writing, and are suggested systems only. Within the suggested guidelines there is plenty of room for substitutions and exchanges depending on the interests of the person receiving the gift.

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Circle No. 95

Gremlins & Imps A Christmas Tale

By Colin Thompson

TITLE:	***MSD SUPER DISK DRIVE***
FORMAT:	
PRICE:	$350.00
LANGUAGE:	
MODEL:	VIC and C-64
AUDIENCE:	Anyone needing a reliable disk drive
SUMMARY:	A high quality 1541 compatible disk drive
SOURCE:	Micro-Systems Development 11105 Shady Trail, Suite 103, Dallas, Texas 75229
RATING:	Excellent
PERFORMANCE:	Fast, reliable and accurate
WARRANTY:	90 days

I am occasionally plagued by gremlins in my computer. They come and go as if their trips to my system were orchestrated by the Malfunction Junction Travel Agency. A couple of months ago the Agency's bus dropped off a small gremlin family inside my 1540 disk drive. Apparently the family liked the exotic location so much that they have taken up permanent residence.

The Commodore drive had served me well for nearly two years. Previous gremlin field trips had lasted but a few days at a time and the little devils had been evicted with comparative ease. The latest group seems to be Raid proof, so I've arranged an exorcism at my local repair shop.

The timing of these gremlins' visits is very bad. Commodore has finally taken some drastic steps to correct the 1541's high infant mortality rate by removing them from the dealer's shelves. Since Commodore's answer to the 1541 problems, the fabled 1542, has not been released as of this writing in early October, I have sought disk salvation from another source. THE MSD DISK DRIVE.

While on a trip to Dallas this summer I visited the manufacturing plant of Micro-Systems Development. The highlight of the plant tour was a small workshop where four engineers were working on the prototype of a 1541-compatible disk drive. The men were filled with enthusiasm about the project and promised me a working sample for evaluation. Three months later the sample arrived in the midst of my latest round of gremlin infestation. The MSD drive was a welcome sight and was pressed into service immediately. At this point I've given the new drive a month's hard work and am quite pleased with the results.

A SUPER DRIVE?

Yes. Commodore has some real competition here. The MSD drive is completely compatible with the VIC, C-64 and Pet systems. It is a direct replacement for the 1540 and 1541 drives. No special interface cards or wiring modifications are necessary. To use the drive you need only to plug it into the wall and connect the serial bus cable to the computer. You can add the MSD drive as a second disk drive on the system also. It works with another 1541 as device 9.

OK - it's compatible, but why is it better? The MSD drive is a REAL disk drive, not a stripped down imitation. The mechanical part of the drive is the highly reliable T.E.C. single side, half-height drive with extensive electronic error correction and motor speed control circuitry. This combination of superior mechanics and electronics results in an overall speed improvement. The "intelligent" part of the drive is a printed circuit card which communicates with the computer and keeps track of your data on the diskette. These functions are accomplished with the help of a 6511Q microprocessor chip.

CHIPS AND DIPS

The 1540/41 uses a 6502 microprocessor chip and two 6522 VIA chips to handle the communication chores. The MSD Super Disk's 6511Q seems to have a big advantage over the 6502/6522 combination - speed. You will see the speed when you NEW a disk for the first time. The 1541 takes about 80 seconds for that task. The MSD NEWs a diskette in only 17 seconds. That's a good example of how much faster the MSD accomplishes internal operations. The drive finds (seeks) tracks faster and needs fewer revolutions to read data from the track. This could mean an improvement of as much as 20 percent in retrieval times.

Continued on page 72

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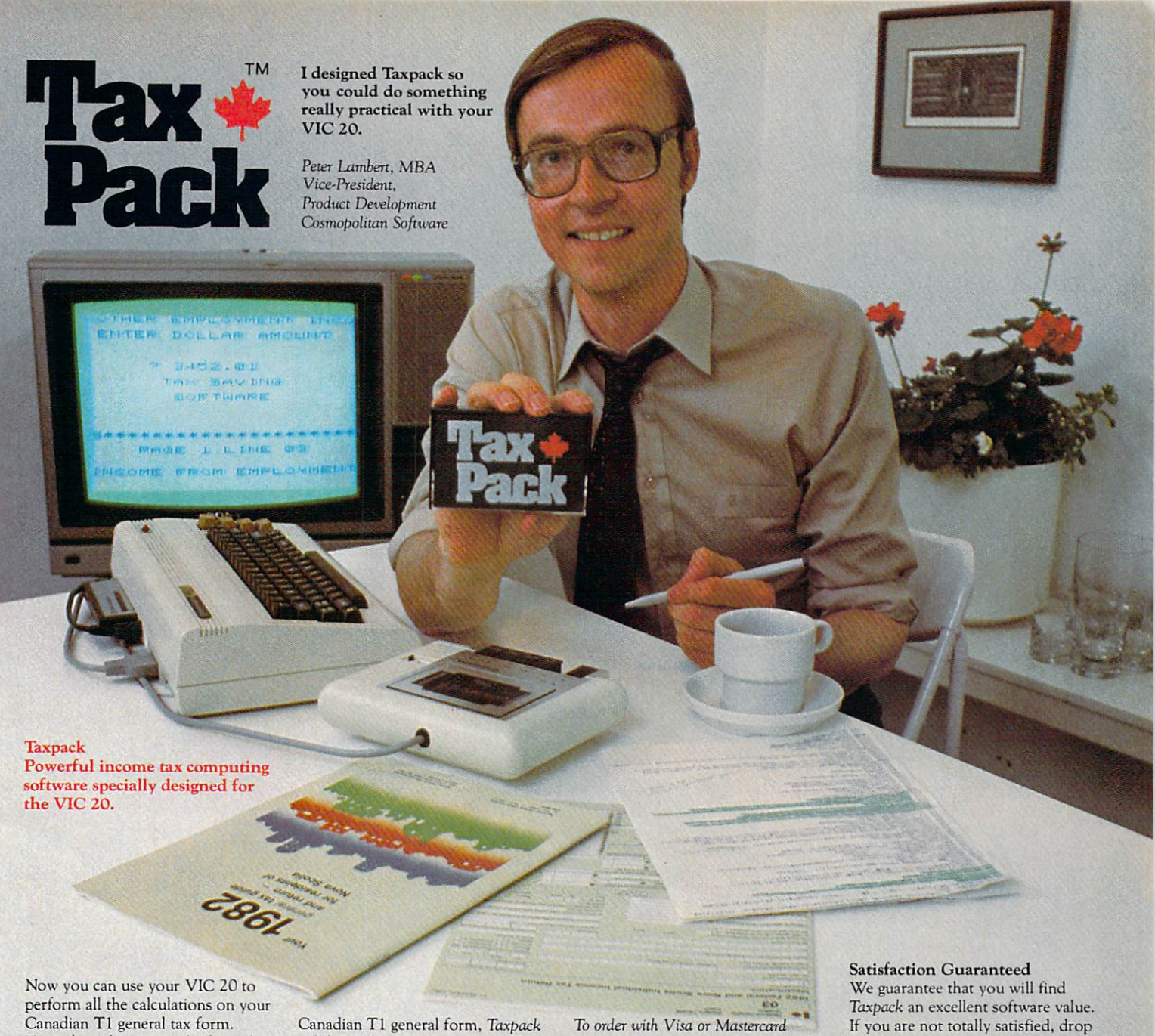
Peter Lambert, MBA
Vice-President,
Product Development
Cosmopolitan Software



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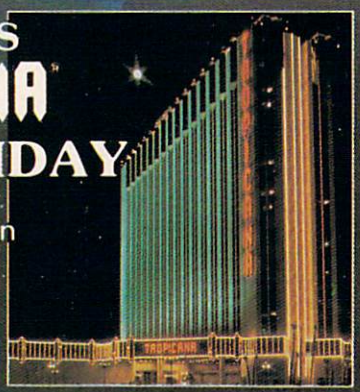

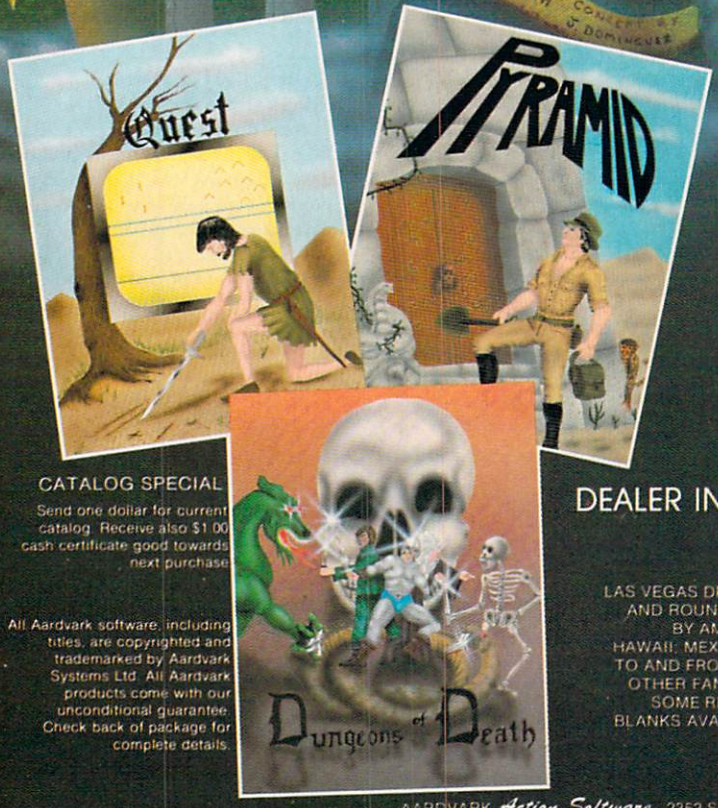

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faulty evaluation/reward systems are used that distract the user from the main purpose of the program.

Many educators, however, can use well-written Drill and Practice programs very effectively. For example, armed with a battery of math software covering a wide range of objectives, a teacher can provide individuals in a class with as much (or as little . . .) practice as they need for mastery of a multitude of discrete concepts.

To develop a Drill and Practice program, you must first know exactly what objective(s) will be studied. A system for problem synthesis must then be formed. Will the program randomly create problems (very easily done in math)? Will a limited number of problems be drawn from DATA included in the program? Maybe the program will draw data from a tape or disk file. (This method, by the way, allows one program to offer practice on many objective levels by accessing several files). The main point is: define which objective(s) shall be dealt with, how the material is to be presented, and how the responses will be evaluated. Then construct a program that sticks to the plan, and can still be interesting to use. The program should also help the student recognize mistakes and give opportunities for correction. Ideally, the student's performance will improve with each program run.

"TIMES TABLES"

If the performance reaches perfection, then it's time to move to the next difficulty level. Included here are VIC and C-64 versions of "Times Tables". As you might surmise from the rather mundane title, this is a multiplication drill. The objective, stated in my best educationese is as follows:

> The user will solve all problems in the multiplication tables for the numbers 0 to 9 when the problems are presented in random order.

This objective is at a higher level than reciting the times tables in order, but at a lower level than multiplying double digit numbers (10 and greater). To meet these specifications, the user must be presented with 100 problems, covering each problem from 0*0 to 9*9 in random order. The method used here involves creating all 100 problems at the beginning of the RUN in lines 105-120, and storing the values in a two-dimensional array set up in line 20. This method supplies numbers between 1 and 10, which are rectified to the correct range in line 130. The same array is also used to store any problems that are missed in the first round. The first section, giving all 100 problems the first time, is in lines 200-220. Since 100 problems in a row can get pretty boring, a "Time Out" routine at line 800 is occasionally called. A little music never hurt, and the break helps users concentrate better on the full battery of problems. Should the student correctly answer all the problems the first time, the program goes to the ending routine. If any problems were missed, the student is told how many were correct the first time (245) and the second try at those missed begins (300-330). If the problems are answered correctly this time, the program goes to the end. If some were still missed, they are slowly printed on the screen with their answers, with the user (and teacher?) being advised of which problems could stand review. At the end the student is given the opportunity either to quit the program or to run it again.

There are no substantial differences between the VIC and C-64 versions, other than instructions concerning the different screen sizes and music addresses. The extra memory in the C-64 could be used to add features to the program, such as hardcopy reporting, changing difficulty levels to match achievement, or routines to store performance data to disk or tape. Future suggestions in this column may prompt you to add or change features as you see fit.

Try "Times Tables" on your little multipliers. You might also want to make some changes to have versions for your little adders or subtractors or dividers. Just keep your objectives in mind, and don't frustrate them with material that is too difficult for them. Any insights and ideas you may have on any of the topics discussed here will always be appreciated, so please don't hesitate to send them in. As mentioned earlier, one of the most important uses of computers is in education, and one of the most rewarding things that you, as an interested programmer, can do is to write programs that will let kids experience the joy of learning.

(Program on page 108)

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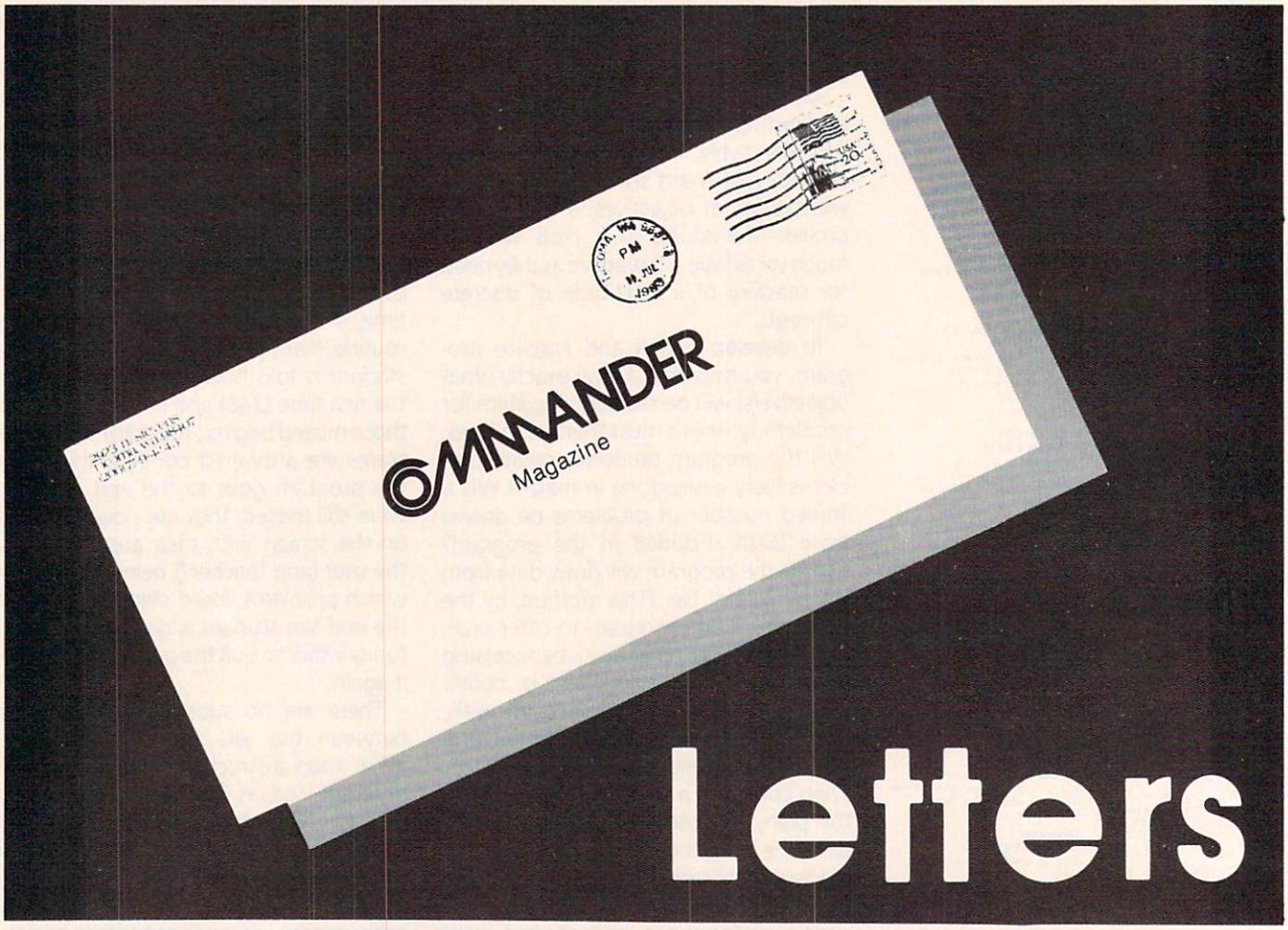

Letters

Dear Mr. Rotenberg:

I have just recently purchased a Commodore 64 computer, and at the time I bought a copy of the August 1983 issue of Commander magazine.

In going through the magazine I ran across your article "An Introduction to Finances". I am very interested in the programs that were part of your article, and I immediately put them on tape so I could use them. Unfortunately, I could not get programs #6 or #7 to work at all. The computer kept coming up with "bad subscript" in both programs.

I wonder if there was a misprint in the article, or if I am doing something wrong. I would appreciate any help you might give me on this matter.

Robert A. McDermott

Dear Mr. McDermott:

I am glad that my article "An Introduction to Finances" was of interest and help to you. In answer to your questions about the errors you are getting in program #6 and #7 I offer this response:

The only part of the program that the C-64 might not like is a statement such as line 100 of program #6. This line reads 100 INPUT"principal";p. Sometimes the C-64 will not accept a statement like that especially if it is over 40 characters long. This is not a fault of the program and the fix for it is as follows: Take any input statement in that format and make it into two statements. The first would be line 100 PRINT "principal". The second would be line 105 INPUT p. By separating this into two statements you will no longer get the possible "redo from start error" that some people may experience. Regarding the error you said you were getting (bad subscript), I would have to say that you must be entering something wrong since the programs do not use any subscripted variables.

I have checked the magazine and the program listing is correct. You may want to read the part of the article that asks you to remove the code that sets the window for the 8032 in program #7, althought it will not harm the program on the C-64 even if left in.

Howard Rotenberg

Dear Sirs:

It was early in February, 1983 when I first purchased *COMMANDER* and telephoned Colin Thompson about the VIC. His enthusiasm sent me to a local store for my first personal computer. I was off and crawling.

Well to make a short common story shorter, I am now well past the game stage and anxiously saving $100 bills to buy a *good* printer, disc drive (not a 1541), Data base, word processor, and spread sheet +40-80 column card. Colin has been of tremendous assistance in all these areas.

Your monthly journal, along with other publications has been a great help to my quickly moving into the VIC and feeling comfortable enough that I may soon be able to earn some money with my new toy.

Alan Williamson

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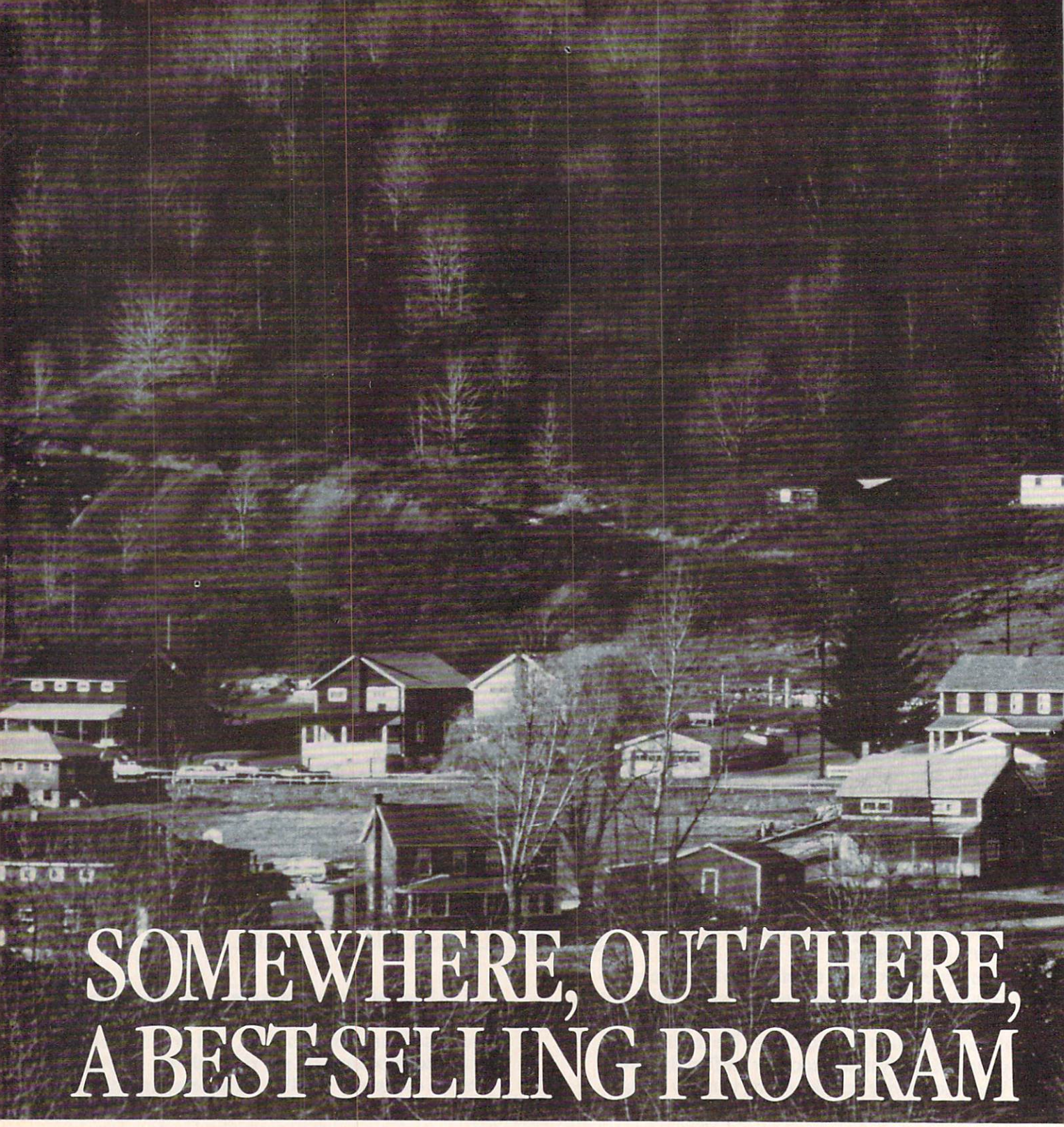

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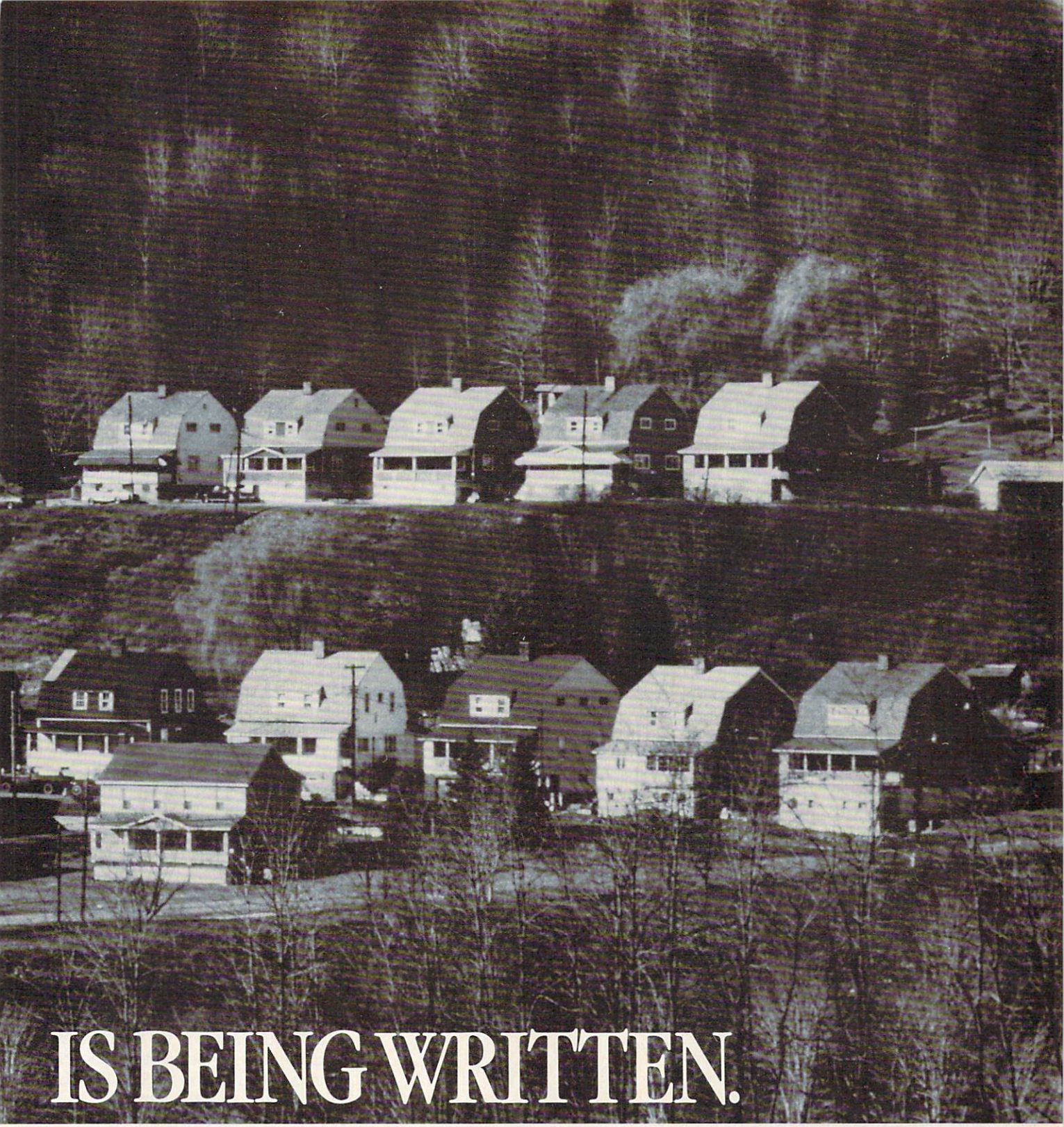

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Circle No. 117

Quick Copy of C-64 Disks

By Noel Nyman and Larry Coats

This article describes a disk utility program for the Commodore 64/1541 Disk Drive that will make back-up copies of Program, Sequential, and User files using a single disk drive. The read and write routines are written in machine language for fast disk operation. Up to 134 disk blocks can be copied in one "pass". Several back-up disks of the same files can be created without re-reading the originals each time.

To leave maximum RAM (computer memory) available to copy files, we've located the machine language routines above the normal BASIC memory area in the C-64. This is usually done using POKEs and DATA statements in the BASIC program. We chose a different method, since the DATA statements are unnecessary once the program is running and "waste" a lot of space.

First, type in the MACHINE LANGUAGE LOADER program, listing #1. Check the DATA statements carefully, since even one error may cause the program to crash later, or may give you bad copies. SAVE the program to disk (use any name for the program except ML DATA, which you'll use later), then RUN it. You should see the program name and a series of numbers flashing on the screen. If all goes well, you'll see the message "Program Loaded" after about thirty seconds. If there is a mistake in your DATA statements, an error message will direct you to the appropriate series of statements.

Once you've successfully RUN the Loader, you'll have two machine language programs in memory, one to read disk files and the other to write them. You need to SAVE these two programs to be used with the copier program, but since they are located above normal BASIC memory, the usual SAVE command won't work on them without some modifications. Do the following EXACTLY as shown:

Type CLR
Hit RETURN
Type (all on one line):
POKE 43,0:POKE 44,193:POKE 45,158:POKE 46,194
Hit RETURN

These commands clear all BASIC variables, then change the memory locations that tell the C-64 where BASIC memory resides.

Type SAVE "ML DATA",8
Hit RETURN

The SAVE command will now work because BASIC memory has been relocated to the machine language area. Both programs are saved at the same time.

Once the SAVE is complete, reset the BASIC pointers to normal by typing SYS 64738 (RETURN) or turning the 64 off and on again.

Now type in the COPIER program, listing #2. This program prompts you through the copying process and calls the machine language programs when necessary. SAVE the program before RUNning it.

When you RUN the Copier program, be sure the disk with ML DATA is in your disk drive. Once the program title and copyright notice appear on the screen you can remove the disk.

You'll be shown your available buffer space and the approximate number of blocks of program you can copy. Place the disk with files you wish to copy in the drive and press RETURN. The program will ask for the first file name. Type in the name as it appears in the disk directory. If you misspell the name, the "File Not Found" message will appear and you'll be asked for the file name again. You can use the "*" wild card if you wish, but the asterisk will become part of the copy file name.

Next you'll be asked for the file type: Program, User, or Sequential. Type the appropriate letter and hit RETURN. The cursor flashes over the letter "P," so if you're copying a program just hit RETURN.

The computer will copy the file, then ask if you want to copy more files. You can change disks at this point if you wish, they type "Y" to continue copying. You can do this until you've copied 24 files or you exceed the 134 block memory limit.To write the copied files to a new disk, type "N" in response to the prompt for more files or just hit RETURN instead of typing a file name.

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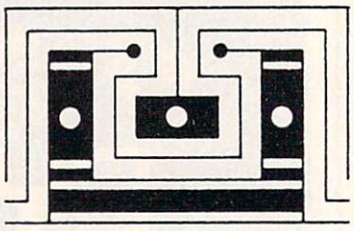
The computer will ask you to place the output disk in the drive and hit RETURN.(The disk must be properly initialized before using this program. Check your 1541 Disk Drive manual.) Then as each file is copied its name will appear on the screen. When all files have been transferred to the new disk, you'll be asked if you want more copies of these same files. If you're making several back-up disks, type "Y" and insert the next disk.

The last prompt will ask if you want to make more copies of different files. If you type "Y" the computer memory will be cleared and you can copy another 134 blocks. When you type "N" to this prompt you'll exit the copier program.

If there is any problem reading or writing the file copies, an error message will appear and the program will stop. The most common errors are trying to write to an unformatted disk, writing to a disk with a write-protect tab in place, or trying to write a file to a disk that already has a file with the same name. If you want to save a program that has the same name as one already on the disk, use the RENAME disk command to change the name of one of the files before using the Copier program.

We think you'll find this utility fast and easy to use for making back-up copies of your disk files.



LISTING 1

```
10 PRINTCHR$(147)"       {RV} MACHINE LANGUAGE LOADER "
20 PRINT"{CD}                  PLEASE WAIT"
25 S1=0
30 FOR X=1 TO 172:READ D:POKE X+49407,D:S1=S1+D
40 X$=STR$(X):PRINT"{HM}{CD}{CD}{CD}{CD}{CD}{CD}{CD}";SPC(20-LEN(X$));"  ";X$:NEXT
45 IF S1<>23377 THEN PRINT "ERROR IN 30000 DATA STATEMENTS":END
47 S2=0
50 FOR X=1 TO 154:READ D:POKE X+49663,D:S2=S2+D
60 X$=STR$(X):PRINT"{HM}{CD}{CD}{CD}{CD}{CD}{CD}{CD}";SPC(20-LEN(X$));"  ";X$:NEXT
65 IF S2<>21360 THEN PRINT "ERROR IN 40000 DATA STATEMENTS":END
70 PRINT"{HM}{CD}{CD}{CD}{CD}{CD}{CD}";SPC(10);"PROGRAM LOADED"
80 END
472 =0
30000 DATA 32,204,255,169,2,162,8,160,2,32,186,255,173,0,192,162
30010 DATA 1,160,192,32,189,255,32,192,255,144,9,141,47,192,169,1
30020 DATA 234,76,164,193,32,183,255,201,0,240,9,141,47,192,169,2
30030 DATA 234,76,164,193,162,2,32,198,255,144,9,141,47,192,169,3
30040 DATA 234,76,164,193,169,0,141,54,192,141,55,192,173,48,192,133
30050 DATA 251,173,49,192,133,252,160,0,32,207,255,170,173,54,192,205
30060 DATA 52,192,208,14,173,55,192,205,53,192,208,6,169,4,234,76
30070 DATA 164,193,238,54,192,208,3,238,55,192,138,145,251,200,208,2
30080 DATA 230,252,32,183,255,201,0,240,207,201,64,240,9,141,47,192
30090 DATA 169,5,234,76,164,193,169,2,32,195,255,32,204,255,169,0
30100 DATA 141,46,192,96,141,46,192,169,0,133,144,96
40000 DATA 32,204,255,169,2,162,8,160,2,32,186,255,173,23,192,162
40010 DATA 24,160,192,32,189,255,32,192,255,144,9,141,47,192,169,6
40020 DATA 234,76,164,193,32,183,255,201,0,240,9,141,47,192,169,7
40030 DATA 234,76,164,193,162,2,32,201,255,144,9,141,47,192,169,8
40040 DATA 234,76,164,193,169,0,141,56,192,141,57,192,173,48,192,133
40050 DATA 251,173,49,192,133,252,160,0,177,251,32,210,255,32,183,255
40060 DATA 201,0,240,9,141,47,192,169,9,234,76,164,193,238,56,192
40070 DATA 208,3,238,57,192,173,56,192,205,54,192,208,8,173,57,192
40080 DATA 205,55,192,240,7,200,208,208,230,252,208,204,169,2,32,195
40090 DATA 255,32,204,255,169,0,141,46,192,96
```

Continued on page 58

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Continued from page 56

LISTING 2

```
100 IF X=0 THEN X=1:PRINT CHR$(147)"LOADING ML PRO
GRAM":LOAD "ML DATA",8,1
110 PRINT CHR$(147)"          PROGRAM COPIER UTILIT
Y"
115 PRINT "<DWN><DWN>                BY LARRY COATS"
120 PRINT "<DWN><DWN>                  (C) 1983"
130 CLR:TP=PEEK(55)+256*PEEK(56):BT=PEEK(45)+256*P
EEK(46)+2000:SZ=TP-BT
140 PRINT "<DWN>BUFFER SIZE ";SZ;"-";BT;"THRU";TP
150 IF SZ<2000 THEN PRINT "<DWN><RON>NOT ENOUGH BU
FFER SPACE":END
160 PRINT"<DWN>APPROXIMATE BLOCKS: ";INT(SZ/254)
170 HI=INT(BT/256):LO=BT-256*HI:POKE49210,LO:POKE4
9211,HI
175 HI=INT(TP/256):LO=TP-256*HI:POKE49212,LO:POKE4
9213,HI
180 HI=INT(SZ/256):LO=SZ-256*HI:POKE49214,LO:POKE4
9215,HI
185 HI=INT(BT/256):LO=BT-256*HI:POKE51,LO:POKE52,H
I:POKE55,LO:POKE56,HI:CLR
190 DEF FNA(X)=PEEK(X)+256*PEEK(X+1):DIM BT(25),NB
(25),NI$(25),PG$(25)
200 PRINT "<DWN><DWN><RON>INSERT SOURCE DISKETTE T
HEN HIT RETURN"
205 GET X$:IF X$="" THEN 205
210 FZ=1:BT(1)=FNA(49210):TP=FNA(49212):SZ=FNA(492
14)
220 POKE 49201,BT(FZ)/256:POKE49200,BT(FZ)-256*PEE
K(49201):POKE49203,TP/256
225 POKE49202,TP-256*PEEK(49203):POKE49205,SZ/256:
POKE49204,SZ-256*PEEK(49205)
230 NI$(FZ)="":INPUT"<DWN><DWN>NAME OF INPUT FILE"
;NI$(FZ)
233 IF NI$(FZ)="" THEN FZ=FZ-1:GOTO 400
235 IF LEN(NI$(FZ))>16 THEN PRINT "FILE NAME TOO L
ONG":GOTO 230
240 CL$=CHR$(157):PRINT"PROGRAM, USER OR SEQUENTIA
L (P/U/S)    P";CL$;CL$;CL$;
245 INPUT PG$(FZ):IF PG$(FZ)<>"P" AND PG$(FZ)<>"U"
 AND PG$(FZ)<>"S" GOTO 245
247 GOSUB 1000
250 CI$="0:"+NI$(FZ)+","+PG$(FZ)+",R":CI=LEN(CI$):
POKE49152,CI:FOR I=1TOCI
255 POKE49152+I,ASC(MID$(CI$,I,1)):NEXT:SYS49408:I
F PEEK(49198)=0 GOTO 265
260 PRINT "<DWN><RON>ERROR IN FILE READ, RE-RUN PR
OGRAM FROM START":GOTO 560
265 NB(FZ)=FNA(49206):BT(FZ+1)=BT(FZ)+NB(FZ):SZ=SZ
-NB(FZ)
```

Continued on page 60

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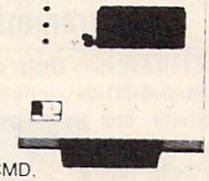

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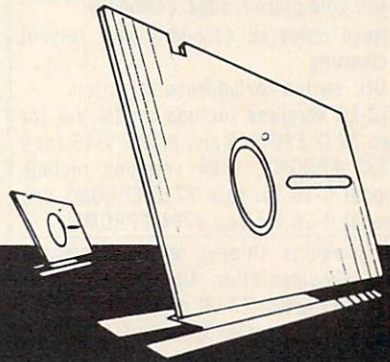

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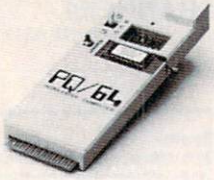

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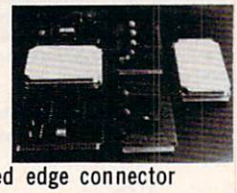

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Continued from page 58

```
270 PRINT"<DWN>BYTES COPIED: ";NB(FZ)
275 PRINT"SPACE LEFT: ";SZ;"BYTES -";INT(SZ/254);"
BLOCKS"
277 IF FZ=24 THEN PRINT "<DWN>MAXIMUM 24 FILE LIMI
T REACHED":GOTO 400
280 PRINT"<DWN>ANOTHER INPUT FILE? (Y/N) ";
285 GET X$:IF X$<>"N" AND X$<>"Y" GOTO 285
290 PRINT X$:IF X$="Y" THEN FZ=FZ+1:GOTO 220
400 PRINT"<DWN><DWN><RON>INSERT OUTPUT DISKETTE TH
EN HIT RETURN<ROF><DWN>"
405 GET X$:IF X$="" GOTO 405
410 FOR F=1TOFZ:CO$="0:"+NI$(F)+","+PG$(F)+",W":CO
=LEN(CO$)
415 POKE49201,BT(F)/256:POKE49200,BT(F)-PEEK(49201
)*256
420 POKE49207,NB(F)/256:POKE49206,NB(F)-PEEK(49207
)*256:POKE49175,CO
425 FORI=1TOCO:POKE49175+I,ASC(MID$(CO$,I,1)):NEXT

430 SYS 49664:IF PEEK(49198)=0 GOTO 440
435 PRINT"<DWN><RON>ERROR IN OUTPUT, RE-RUN PROGRA
M FROM START":GOTO 560
440 PRINT NI$(F);" SUCCESSFULLY COPIED":NEXT
500 PRINT "<DWN>ANOTHER COPY OF THESE SAME FILES?
(Y/N)";
510 GET X$:IF X$=<>"Y" AND X$<>"N" GOTO 510
520 PRINT X$:IF X$="Y" GOTO 400
530 PRINT"<DWN>COPY MORE FILES? (Y/N)";
540 GET X$:IF X$=<>"Y" AND X$<>"N" GOTO 540
550 PRINT X$:IF X$="Y" GOTO 200
560 LO=PEEK(49212):HI=PEEK(49213)
570 POKE 51,LO:POKE 52,HI:POKE 55,LO:POKE 56,HI:CL
R:END
1000 OPEN15,8,15:OPEN2,8,2,NI$(FZ):INPUT#15,AA,AA$
:CLOSE2:CLOSE15
1010 IF AA=0 THEN RETURN
1020 IF AA=62 THEN PRINT"<DWN>FILE ";NI$(FZ);" NOT
 FOUND":GOTO 230
1030 PRINT"<DWN>DISK ERROR, ";AA$":GOTO 260
```

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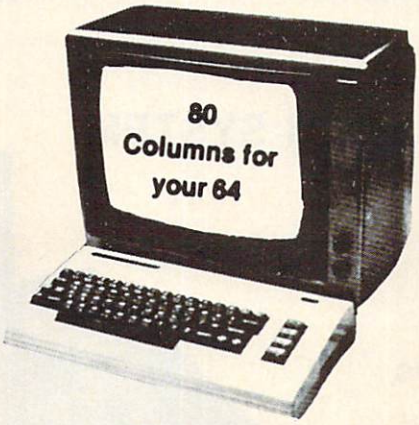

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- **FRICTION AND TRACTOR FEED:** will accept single sheet paper.
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Rees Software Lab
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Boston Educational Computing, Inc.
BSI, Blue Sky Software
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Bytes and Pieces #2
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Comm*Data Software
Computer Mat
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JMD Enterprises
Krell
Limbic
Midwest Micro
Mystic Software
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Rocky Software
Sail Software
Skylight Software
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Software Guild
Southern Solutions
Systems Management Associates
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Bear Computer Systems
BSI, Blue Sky Software
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Bytes and Pieces #2
CGRS Micro Tech
Comm*Data Software
Computer Network
Computer Outlet
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ISA
Jini Micro
JMD Enterprises
Limbic
(M)agreable Software, Inc.
Micro Management
Micro Spec
Midwest Micro
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Progressive Peripherals
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Rocky Software
Sail Software
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SJB Distributors
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Southern Solutions
Southwest Micro
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Bytes and Pieces #2
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Comm*Data Software
Computer Alliance
Computer Outlet
Computer Place
Computer Software
Double E Electronics
Dynatech
Electronic Lab., Inc.
Fabtronics
Farthest Fringe
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Gloucester Computer, Inc.
GOSUB International
GOSUB of Slidell
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Intelligent Software
ISA
Jini Micro
JMD Enterprises
Limbic
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Micro Management
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Micro Spec
Midwest Micro
Mirage Concepts
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Computer Network
Computer Outlet
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Eastern House
Fabtronics
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ICD Corporation
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L & L Engineering
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Eastern House
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GOSUB International
Micro Management
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Bytes and Pieces #2
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CGRS Micro Tech
Computer Place
Eastern House
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Hanna Enterprises
JMD Enterprises
Limbic
Microware Distributors
Obbligato
Optimized Data Systems
Personal Computers
Precision Technology, Inc.
Pyramid Computerware
Quality Computer
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Computer Equipment

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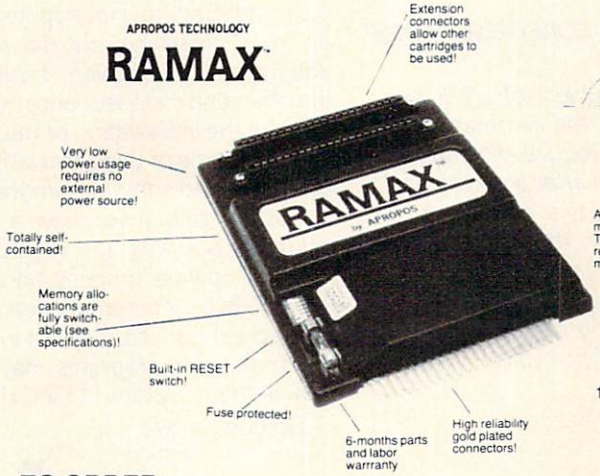
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  RESET (Resets computer without power off/on)
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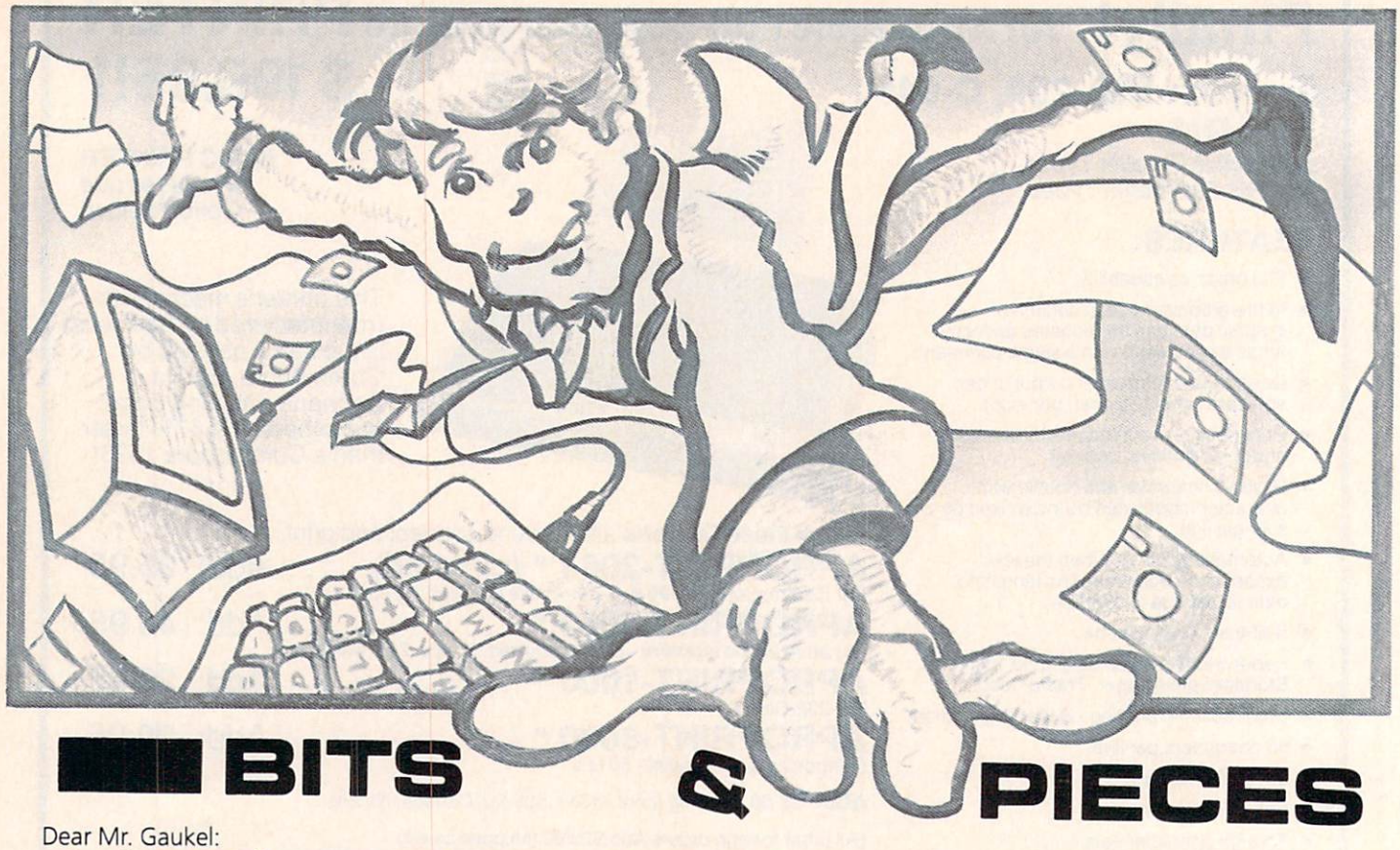


BITS & PIECES

Dear Mr. Gaukel:

Your "USER.DATA" program in *COMMANDER* May Issue has opened up a world of possibilities for me. It's a fabulous deal for the price of a magazine and the effort of getting it running.

Since my knowledge of machine language is not that great, there is one little bug I haven't been able to solve. Whenever I use USR (71) or USR (72) the lines are plotted incorrectly.

I have triple checked the data statements in the basic loader program and can't find any typing errors.

I have enclosed a listing and a diagram of the resultant plots. Is there a misprint in the magazine or am I making an error somewhere?

I'm at my wit's end trying to figure this out. I would greatly appreciate your help.

Fred Kohler

Dear Fred,

There definitely is a bug in the USER 71 and 72 commands. The instruction and code at 51267 ($C843) needs to be deleted by changing to NOP (No-Operation). Make the following changes in line 3680 of data statements:

3680 DATA 207, 240, 3, 234, 234, 234

If you have machine language versions on disk, that you have saved/relocated using a system monitor, then you also have the options of making direct changes and resaving the program or changing the code during a BASIC boot (this would apply to disks I have sent out with precompiled versions for various load addresses).

```
141 BASE = 49152 :REM $C000
142 OFFSET = BASE + 2115
143 NOP = 234
144 FOR I = 0to2 :POKE OFFSET + I,NOP
    :NEXT
```

While on the subject of USER bugs, there are some in the command table. USER 99 and 100 require the argument of a voice number after the command. USER 102 requires two arguments, the voice number then the waveform 0-3 (triangle, sawtooth, pulse or noise). As I set the value of zero to default to the first voice, zero and one can be used interchangeably for the first voice.

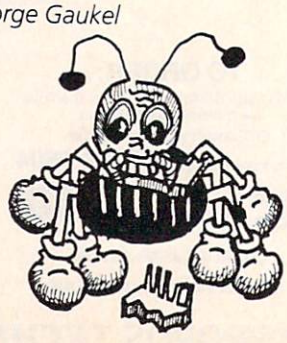
George

A ROM BUG IN THE C-64

I spent more time solving this little problem than I care to admit. The two different versions of the C-64 KERNAL ROM have some very small differences on how the VIC chip is initialized. In V2, a raster scan reading is taken in order to fine tune the IRQ countdown constant for 50 or 60 Hz. What this means is that the raster scan latch is left on the read mode. In V1 the raster scan latch was initialized to the write mode. The high bit of 53265 ($DO11) controls whether the raster scan latch at 53266 ($DO12) is in the read or write mode.

A program I had written using raster scan interrupts to move sprites worked on my V1 machine, but did absolutely nothing on a V2 machine. I finally located the offending code sequence in the table used for the initialization of the VIC chip. This is the type of thing that will put programmers and software vendors into little padded cells. If you have a program written on a V1 machine, which does not seem to operate properly on a V2, try POKE 53265,27 before you load and run the application. This may not work in all cases, as some programs may call the routine that initializes the VIC chip.

George Gaukel



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COMMODORE 64 SOFTWARE

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Two utility programs, one for a single 1541 system the other for a two 1541 system. This routine will copy each Track and Sector starting with Track 1 Sector 0 and will continue through Track 35 Sector 16. For the Commodore 64.

SOUTHERN SOFTWARE:

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Continued from page 46

IS IT 8 TIMES FASTER?

No. I'm asked that question because the ads for the MSD drive clearly state that it can use the parallel IEEE interface. This interface transfers data 8 bits (one byte) at a time. Pets use the IEEE to achieve high data transfer rates. VICs & C-64s normally use the serial interface. The serial bus transfers data to the disk or printer 1 bit at a time, hence the question "Is it 8 times faster?".

If you use the MSD with the standard serial bus, the operation is 10 to 20 per cent faster. The IEEE bus will net you a much greater improvement, but not the theoretical "8 times". The rear of the MSD drive has the usual two serial bus sockets and one IEEE socket. I have not tried the IEEE bus yet, but I will report its usefulness in a future column.

STOCKING STUFFER

Physically, the MSD differs from the Commodore drive in many ways. It is smaller and sits upright. The case is aircraft aluminum and serves double duty as a heatsink for the power regulation transistors. In normal operation the case is slightly warm to the touch. The "disk activity" LED on the front panel displays either a red or green color depending on the status of the drive. The diskette is inserted vertically, with no extra pressure required to seat it. A small handle rotates 90 degrees to lock the diskette in place. The drive is noisier than the 1541 but it is faster and more accurate. I think the trade-off favors the MSD.

THE MANUAL SPEAKS VOLUMES

The user's manual that accompanies the drive is a complete, lucid explanation of how a disk drive works and how to make it work for you. After reading it through one time I realized that I finally understood how blocks are allocated for a random access file. The B-A, B-P and all the other disk commands are no longer mysteries to me. Each command is illustrated by an example program, written in BASIC. The manual reveals the meaning of such esoteric commands as Memory Read, Write and Execute. The MSD drive uses 6511Q, a 16K ROM operating system and 8K or RAM to keep track of everything. The 8K of RAM is available to high level programmers for tasks that only high level programmers should attempt.

DOUBLE YOUR PLEASURE DOUBLE YOUR FUN

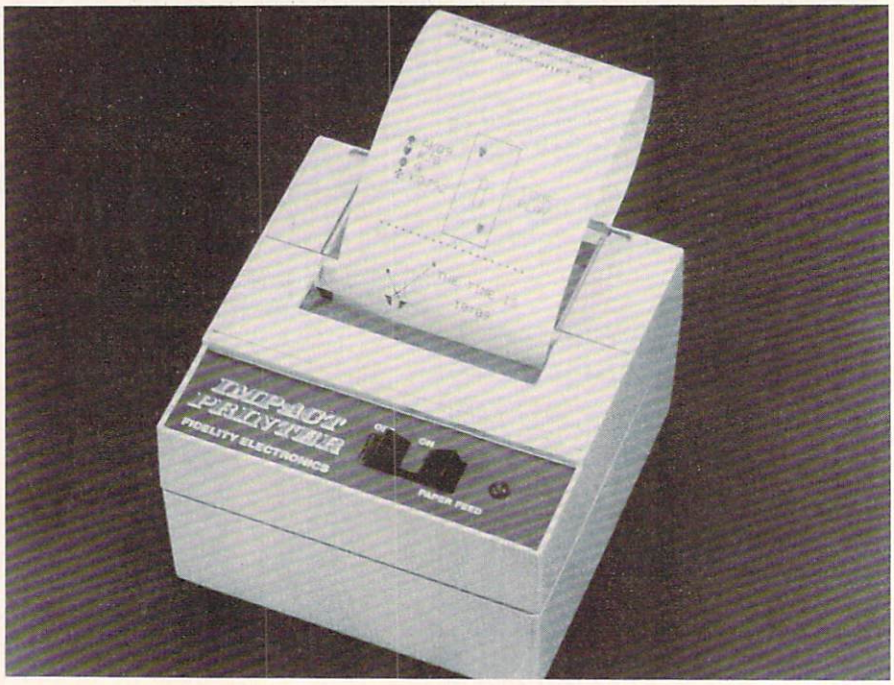
A double disk drive? Jim Gragg, the Chief Engineer of the disk drive project at MSD, reports that a 4040 compatible drive is in the works. The release date has not been set, but if the rumors of the demise of the Commodore 4040 prove to be true, the MSD Double might be the only game in town. (If you know what Commodore is doing, please write me. The rest of us would like to know.)

THE SUPER DISK DRIVE

MSD had delivered the product that their ads have been telling us about for several months. It's everything they claim. The $350 price tag is certainly within reason. It reflects the high quality mechanics and advanced electronics that are built into drive. The only hitch I can report is a problem of success–the drive is in short supply.

GOODBYE GREMLINS, HELLO IMPS

I'll bet you thought I was just kidding when I suggested the MSD drive as a stocking stuffer. (You will need an industrial grade stocking.) Well, would you believe a 40 column printer that DOES fit into Johnny's stocking?



TITLE:	***IMP PRINTER***
FORMAT:	
PRICE:	$129.00
LANGUAGE:	
MODEL:	VIC and C-64
AUDIENCE:	Anyone needing a low cost printer
SUMMARY:	A small dot matrix printer
SOURCE:	Fidelity Electronics 8800 N.W. 36th St. Miami, FL 33178
RATING:	Good
PERFORMANCE:	Its usefulness is limited by the narrow paper width, but performs well.
WARRANTY:	90 days

The IMP, short for IMpact Printer, is just such a critter. At first glance, the printer looks too small to do anything useful. It easily fits in the palm of your hand and weighs about one pound. It uses ordinary two-and-a-quarter-inch adding machine paper rolls.

A close examination of the user's manual reveals a host of printing modes and options. The IMP is a dot matrix printer, but differs from the bigger printers in one important area. Its print head has only one wire, not the usual 7, 8 or 9. This means the print head makes 8 passes across the page to form a complete character.

IMP plugs into the serial port of the VIC or C-64 just like the VIC 1525 printer. When the printer is turned on it prints READY and awaits your commands. I've found that the IMP behaves in most respects like the 1525 printer, only smaller. It can print in three different widths: 24, 32 and 40 columns. It will print the entire Commodore character set, including the graphics characters. Redefined (custom)

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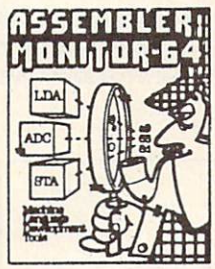

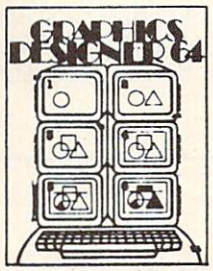

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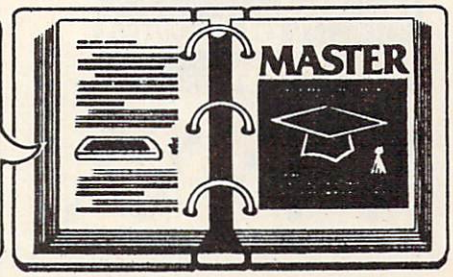

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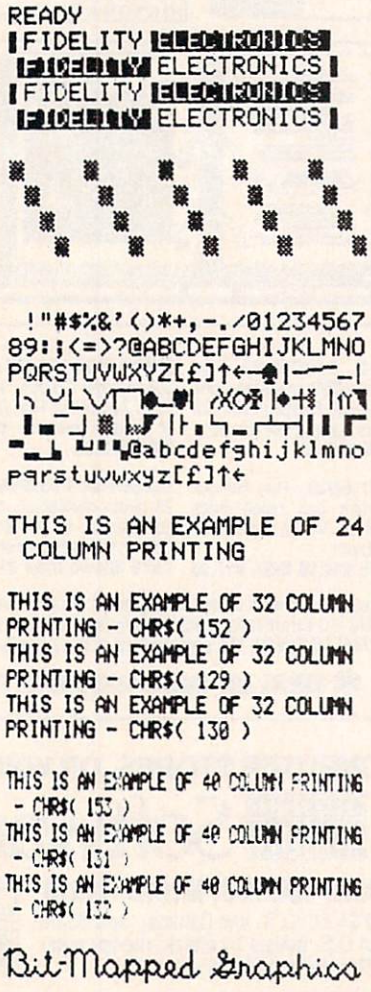
characters may also be printed. Two different printing modes may be selected by using a secondary address, just like the VIC printer.

HAVE PRINTER, WILL TRAVEL

I can see some useful applications for this midget. The most obvious is portability. It would also serve well as a "first printer" for those on a tight budget. It doesn't require an expensive printer interface–you simply plug it in and start printing. The owner's manual is one of the best printer primers I've seen. There is a BASIC example program for each feature. The manual features program listings for a screen dump, a mini word processor, custom characters and bit-mapped graphics. The printer will not print double wide characters (chr$(14)) like the VIC printer, but will print double height characters.

The print quality at 24 columns is very good, but gets harder to read as it is expanded to 32 and then 40 wide. The printing sample included here actually looks better in real life than on this printed page.


READY
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FIDELITY ELECTRONICS
FIDELITY ELECTRONICS
FIDELITY ELECTRONICS
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89:;<=>?@ABCDEFGHIJKLMNO
PQRSTUVWXYZ[£]↑←@abcdefghijklmno
pqrstuvwxyz[£]↑←
THIS IS AN EXAMPLE OF 24 COLUMN PRINTING
THIS IS AN EXAMPLE OF 32 COLUMN PRINTING - CHR$(152)
THIS IS AN EXAMPLE OF 32 COLUMN PRINTING - CHR$(129)
THIS IS AN EXAMPLE OF 32 COLUMN PRINTING - CHR$(130)
THIS IS AN EXAMPLE OF 40 COLUMN PRINTING - CHR$(153)
THIS IS AN EXAMPLE OF 40 COLUMN PRINTING - CHR$(131)
THIS IS AN EXAMPLE OF 40 COLUMN PRINTING - CHR$(132)
Bit-Mapped Graphics

The suggested retail price of $129.00 is probably a myth. I expect to see it at less than $100.00 in the mail order houses. The price includes the printer, a roll of paper, a replaceable ribbon cartridge, and a 90-day warranty. Available from Fidelity Electronics, 8800 N.W. 36th Street, Miami, Fl 33178.

CHRISTMAS CARDS

One of the most useful items to cross my desk this year is a set of System Reference Cards for the VIC, C-64 and the 6502 microprocessor. The fold-up, shirt pocket sized cards instantly reminded me of my misspent youth. I repaired Univac computers for several years following my hitch in the Air Force. Each of the mainframes and minis that I worked on had their inner workings laid out on a system reference card. The cards provided ready access to the kind of information I needed occasionally, but were too complex to memorize.

The Commodore cards are the result of several months of research. Each card presents graphic illustrations of the entire character set, the ASCII and CHR$ values of each character, and information about every major register in the computer. The information is laid out in a clear manner. The C-64 card explains how musical tones are generated and how the alternate screens work. After reading the section on music, I finally understood what was necessary to make music. Attack, sustain, decay and release finally mean something to me!

The 6502 card is an absolute must for novice M/L programmers (like me). I recommend the cards to anyone who uses BASIC. The cards retail for $5.95 each and are worth every penny. They are also available for the "off-brand" computers like Apple and Atari. Nanos Systems, Box 24344, Speedway, IN 46224. The cards are also available in B. Dalton bookstores.

Figure 1

VIC-20 18 PAGES COMPLETE SUMMARY PLUS GRAPHICS

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- ALL GRAPHICS KEYS BY GRAPHIC, UPPER AND LOWER MODE
- ALL GRAPHICS CHR$ CODES BY GRAPHIC, UPPER AND LOWER MODE
- ALL GRAPHICS PEEK/POKE CODES BY GRAPHIC, UPPER AND LOWER MODE

Figure 2

KEYS	CQ	CW	CE	CR	CD	CF	CC	CV	⌘£	C*	CB		
CHR$	171	179	177	178	172	187	188	190	169	223	191		
CHR$	235	243	241	242	236	251	252	254	233	127			
POKE	107	115	113	114	108	123	124	126	105	95	127		
KEYS	CQ	CW	CE	CR	CD	CF	CC	CV			CB	⌘↑	C↑
CHR$	171	179	177	178	172	187	188	190			191	255	255
CHR$	235	243	241	242	236	251	252	254				126	222
POKE	107	115	113	114	108	123	124	126			127	94	94

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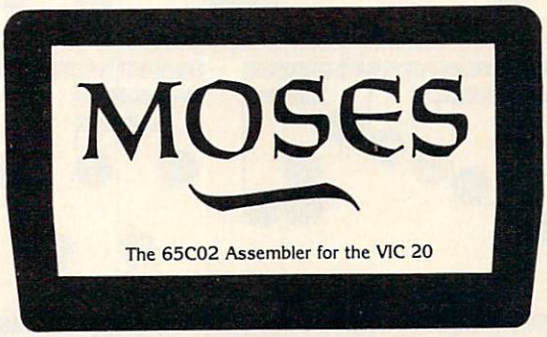

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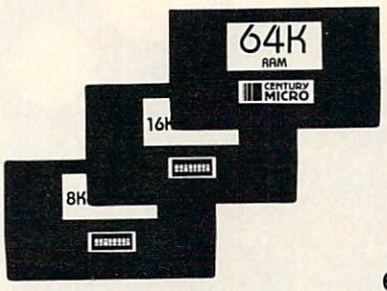

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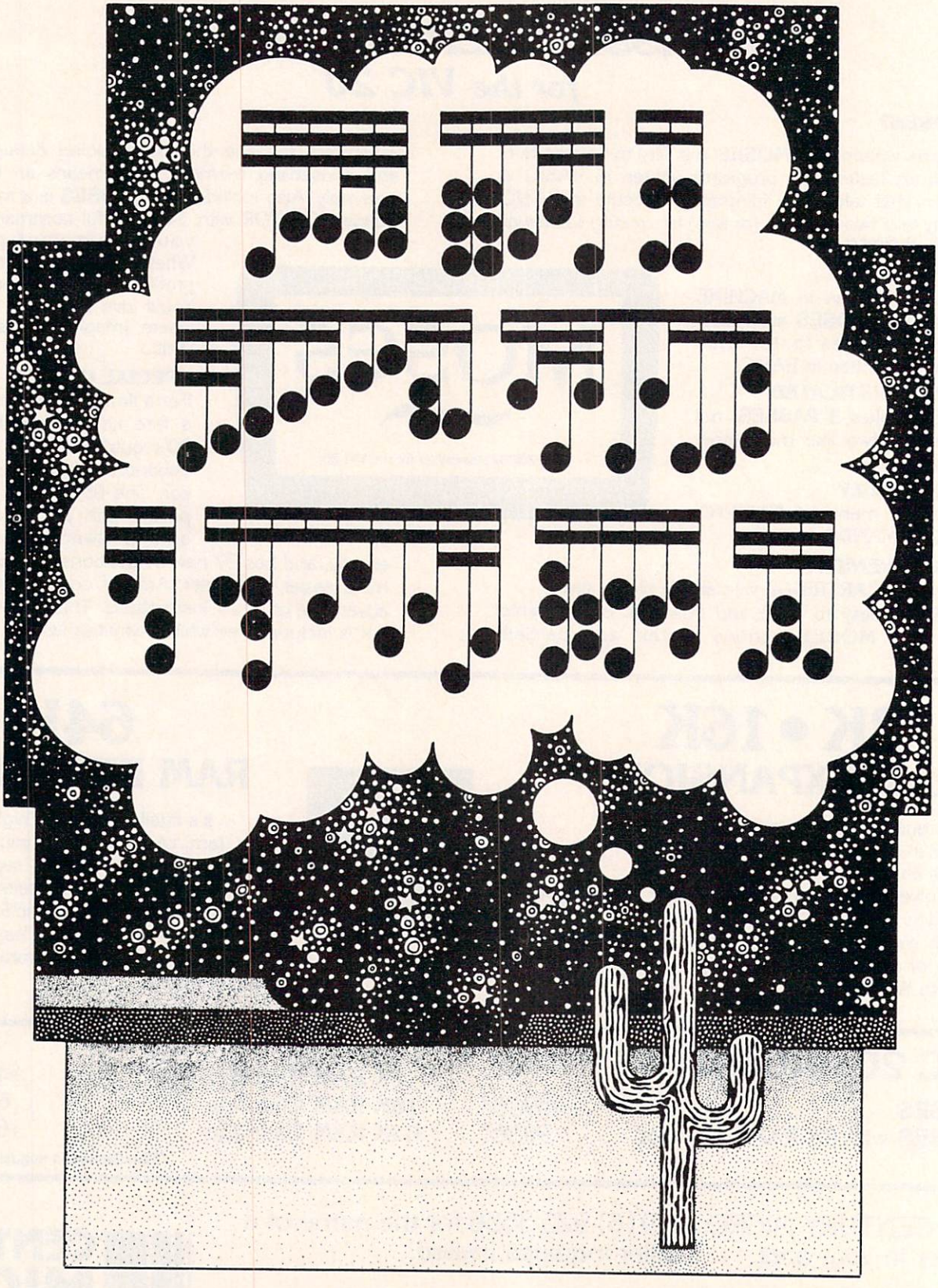

By Ian Adam

There are many published programs for producing conventional notes and tones on the excellent sound chip in the Commodore 64. This article explores some of the more complex sounds available through software control of the chip. Although the techniques are advanced, no special expertise is required, and the program is easy to enter.

ABSTRACT

Interesting and realistic sounds can add a great deal of sparkle to your favorite programs. They can also be used to intrigue and entertain the user, while drawing attention to important inputs. The sound synthesizer chip in the Commodore 64 offers a world of sounds previously unavailable from a computer. Immediately available are four different waveforms, as well as control of pitch, volume, and shape of the note. There are several programs and interesting articles available to make access to these sounds easy; one example is the 'Piano Keyboard' program on page 147 in the User's Guide. Programs of this type give the user immediate access to the basic facilities of the sound chip, while demystifying the many POKEs that are required.

INTRODUCTION

For those who are new to the sound chip, here is a brief review of how 'SID' works (that's short for Sound Interface Device). If this sounds like *deja vu* to the more experienced user, just skip to the next paragraph. There are three separate voices in the sound chip, and each of these has seven control registers. A further four registers provide overall control of volume and filters. Appropriate values are POKEd into these registers, then the chip operates independently to create the specified sound. While this is in progress, the computer is free to continue with other tasks. The seven registers for each voice are:

- 0,1 Pitch control, to select a note.
- 2,3 Waveform width (for pulse wave only).
- 4 Master register to select waveform shape, and turn it on and off.
- 5,6 To control attack, decay, sustain, and release; these determine whether the note will pluck, hum, or strum, etc.

These seven registers begin at location 54272 for voice 1, 54279 for voice 2, and 54286 for voice 3. The four overall control registers are:

- 54293 & 54294 Filter frequency.
- 54295 Filter and resonance control.
- 54296 Master volume and filter control.

It is not my intent in this article to review the details of using these controls to make very basic sounds, as this has been covered elsewhere. What we will be doing is using some different techniques on these same registers to create some very interesting sounds.

SOFTWARE CONTROL

There is an additional dimension of sounds that can be produced through software control of the SID chip. While the User's Guide and Programmer's Reference Manual make passing reference to these techniques, they provide very little in the way of detail. This is quite surprising, since they are really very easy to use, and allow the programmer a lot of imagination in creating sound. So . . . here we go.

What we will do is prepare a very short program as a framework for experimentation. By changing a couple of lines, we can then try out the various techniques easily. After experimenting and developing a sound effect you like, it is a simple matter to incorporate these statements as a subroutine in another program. Some of the additional tricks we will be exploring with this program are:

1. Sweeping through a frequency range with a software loop.
2. Ring modulation of two voices.
3. Synchronization of two voices.
4. Peeking location 54299, which reads the waveform output of voice 3.
5. Peeking location 54300, which reads the output of the envelope generator of voice 3.

These techniques can be used singly or in combination when generating sounds, as we will see shortly.

Here is our framework program, which we will modify as we go:

```
10 SI=54272:W1=SI+4:W3=SI+
   18:V=SI+24:PW=SI+27:PE=
   SI+28
20 FOR I=SI TO PE:POKEI,0:NEXT
30 POKE W1+1,17;POKE W1+2,251
   :POKE W3+1,187:POKE W3+2,
   140
40 POKE V,143:POKE W3,17
50:
60:
70:
80:
90:
100 POKE V,0:POKE W1,0:POKEW3,0
```

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Line 10 defines a series of variables equal to important SID registers, to save us the trouble of typing in the same numbers repeatedly.

Line 20 clears all SID registers to zero.

Line 30 sets some basic values for attack, decay, sustain, and release of both voices. In some of the examples, these may be changed.

Line 40 turns on the volume. But wait... wouldn't POKE V,15 be the usual way to do this? Yes, but adding 128 to this value has the effect of turning OFF voice 3; we don't want to hear it because we will be using its output to modulate voice 1.

Lines 50 to 90 are blank now, but we will fill them in as we go.

Line 100 turns everything off when we are finished.

Don't run the program just yet; it won't do anything until we fill in the missing lines.

FREQUENCY SWEEPS

Normally when a note is played, a value is placed into one or both of the first two control registers, to select the frequency (or 'Pitch') of the note. The technique of frequency sweeps involves rapidly changing that value WHILE the note is being played, so as to produce a rising or swooping tone. This is done with FOR-NEXT loops, for the greatest control of the effect. For example, add these two lines to the framework program and run it:

```
50 POKE W1,17
60 FOR I = 30 TO 200 STEP 3:POKE
   SI+1,I:NEXT
```

Line 50 turns on voice 1 with a triangular waveform.

Line 60 generates a series of increasing numbers with the FOR-NEXT loop (that is, 30, 33, 36, etc., up to 200), then POKEs these into the frequency register of voice 1, creating a rising tone.

As a further example of the flexibility of this approach, add these three lines to the program for a familiar sound:

```
70 POKE W1,0:FOR I = 1 TO 150:
   NEXT:POKE W1,17
80 FOR I = 30 TO 120 STEP 3:POKE
   SI+1,I:NEXT
90 FOR I = 120 TO 20 STEP -1.5:
   POKE SI+1,I:NEXT
```

Line 70 turns voice 1 off for a short delay, then back on again.

Line 80 produces another rising tone.

Line 90 is very similar, but note that the STEP value is negative, so the resulting sound is a falling tone instead of a rising one.

Experiment with different values for the loop parameters; it is amazing what a

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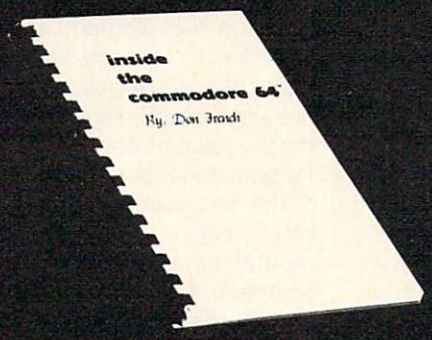

This step-by-step guide to machine language and assembly language programming will teach you what you don't already know and assist you to use what you do. Combined with the integrated set of software tools of Develop-64, it makes the ideal development system.

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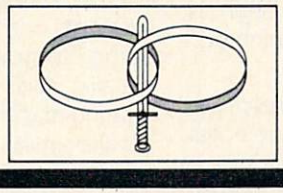

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variety of different effects can be achieved. One good example would be sirens, although we will see a much better way of creating them later.

Another potential variable is the waveform. For the sound of a rocket blastoff, try this example using the white noise generator:

```
50 POKE W1+2,253:POKE W1,129
60 FOR I = 0 TO 90:POKE SI,0:POKE
   SI+1,I
70 FOR J = 1 TO 254-I STEP I/2 OR
   1:POKE SI,J:NEXT J:NEXT I
80 POKE W1,128:FOR I = 1 TO 5000:
   NEXT 90:
```

Line 50 adjusts the sustain and release, and starts voice 1 with the noise generator.

Lines 60 and 70 are the frequency sweep; in order to get a finer-grained sweep we are using both of the frequency registers, instead of just one as we did before.

Line 80 signals the noise to begin its release, then a delay before turning off.

RING MODULATION

This is one of the built-in features of the 64. In brief, the SID combines two notes of different frequencies to produce a single 'ring-modulated' output. The result is a note with non-harmonic overtones; by varying the frequency of both voices, a wide range of gongs, bells, chimes, etc. can be created. Any pair of voices can be selected, but we will use voice 3 to modulate voice 1. This is why we silenced the output of voice 3 in line 40 of the program. Here are the steps to use ring modulation:

- frequencies must be selected for both voices.
- the triangular waveform MUST be selected for the output voice.
- the ring modulation bit (bit 2 of the voice's control register) must be turned on.

This is not as complicated as it sounds; the last two steps simply involve poking a combined value of 21 into location 54276 (which we have called W1). Enter these additional lines, then run the program:

```
50 POKE W1+2, 122
60 POKE W1-3,30:POKE W3-3,23
70 FOR I = 1 TO 8:POKE W1,21
80 FORJ= 1 TO 200:NEXT:POKE
   W1,20
90 FOR J = 1 TO 1500:NEXT J:NEXT I
```

Line 50 sets a sustain/release value suitable for a bell or gong, which has a sharp attack and decay when struck, then a very slow release as the sound gradually fades away.

Line 60 sets the two frequencies.

Line 70 sets the number of chimes, and selects ring mod.

Line 80 calls for a delay before releasing the note.

Line 90 is a second delay to allow the note to fade before sounding the next.

Try experimenting with the two frequencies, both of which are contained in line 60. For another example, replace the first value (30) with 50, and the second (23) with 56. Many other combinations are possible, so feel free to experiment.

SYNCHRONIZATION

This technique is very similar in concept to ring modulation. The output from two separate voices is combined to produce one composite note. However, the method of combining them is somewhat different, with the analog value of the two notes being logically ANDed. Don't try to understand that (I don't) . . . just listen to the result! It produces a different overtone, one that I can only describe as being somewhat 'reedy', or even metallic, such as you might hear from rotating machinery. The process of using it is also similar to ring mod, requiring the selection of two frequencies for the two voices, and POKEing location 54276 with a value of 19 (for triangular wave), or 35 or 67 (for sawtooth or pulse waves). Unlike ring mod, synch will work with any waveform, not just triangular.

This simple example illustrates several typical combinations of frequencies:

```
50 POKE W1-3,31:POKE W1,19
60 FOR I = 1 TO 8:POKE W3-3,4+I
70 FOR J = 1 TO 300:NEXTJ:NEXTI
80:
90:
```

Line 50 selects a frequency for voice 1, and gates it with the synch bit (bit 1).

Line 60 generates 8 different numbers with the FOR-NEXT loop, and POKEs each in turn as the frequency for voice 3.

Line 70 simply inserts a delay after each note.

After you run this an interesting point to note is that you hear the output of voice 1, yet the pitch of this voice wasn't changed . . . the different notes are produced by varying the pitch of voice 3, whose output has been silenced! It is only because voice 1 is being synchronized with voice 3 that the differing notes are heard.

Again, there is an almost limitless number of possible combinations, so experiment as you will. Change only these two lines to add a short, repetitive frequency sweep and create a waver:

```
60 FOR I = 1 TO 15
70 FOR J = 0 TO 10:POKE W3-3,20+
   ABS(J-5):NEXT J:NEXT I
```

Line 60 introduces the waver.

Line 70 generates a series of numbers varying rapidly between 20 and 25, and POKEs these into the frequency of voice 3.

COMBINATIONS

Now let's try combining some of these different techniques. The first example uses ring modulation as the basic note, then introduces a frequency sweep on the pitch of voice 3. Listen to the amazingly complex sounds this very simple program generates:

```
50 POKE W1-3,31:POKE W1,21
60 FOR I = 1 TO 175 STEP 0.1
70 POKE W3-3,I:NEXT
```

Line 50 selects a basic frequency and ring mod for voice 1.

Lines 60 and 70 add the frequency sweep to voice 3.

At any point during this example, you can stop the program with the RUN/STOP key to hear the sound being produced, then restart it by typing CONT and pressing 'return'. Experiment by changing the value of 21 in line 50 to 19 or 35 for synchronization.

The next example illustrates a musical effect called 'beating'. When two musical notes are very close to one another in frequency (or to multiples of one another), the two sound waves will create an interference pattern. They are momentarily in phase and reinforcing each other, and then out of phase and opposing. The result is that the sound volume wavers up and down. This effect is used by guitar players to tune their instruments; as one string is tuned to another, the beating frequency will gradually get slower. When it stops, the strings are in perfect tune.

Add these three lines to the program:

```
50 POKE W1-3,13:POKE W3-3,12:
   POKE W3-4,225;POKE W1,21
60 FOR I = 1 TO 3000:NEXT:POKE
   W1,20
70 FOR I = 1 TO 1500:NEXT
```

Line 50 establishes two frequencies that are within one percent of one another, then specifies ring mod so the notes will be combined.

Line 60 introduces a delay before releasing the note.

Line 70 is another delay before the note is turned off.

This effect sounds much like one of the previous examples, but the method used to achieve it is totally different. In the previous case, a series of different values

Continued on page 142

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By Harry Metz

```
5 S=54272
10 FORL=STOS+24:POKEL,0:NEXT
20 POKES+24,15
30 POKES+3,8:POKES+2,0
40 POKES+10,8:POKES+9,0
50 POKES+17,8:POKES+16,0
60 POKES+5,9:POKES+6,0
70 POKES+12,9:POKES+13,0
80 POKES+19,9:POKES+20,0
100 READA$
110 IFA$="A"GOTO200
120 IFA$="B"GOTO500
130 IFA$="C"GOTO700
140 IFA$="D"GOTO900
200 READH1,L1,D1,H2,L2,D2,H3,L3,D3
210 IFH1<0THENEND
220 POKES+1,H1:POKES,L1:POKES+8,H2:POKES
   +7,L2
230 POKES+15,H3:POKES+14,L3
240 POKES+4,65:POKES+11,65:POKES+18,65
250 FORT=1TOD3:NEXT
260 POKES+18,64
270 READH1,L1,D1,H2,L2,D2,H3,L3,D3
280 POKES+15,H3:POKES+14,L3
290 POKES+18,65
300 FORT=1TO125:NEXT
310 POKES+4,64:POKES+11,64
320 READH1,L1,D1,H2,L2,D2,H3,L3,D3
330 POKES+1,H1:POKES,L1:POKES+8,H2:POKES
   +7,L2
340 POKES+4,65:POKES+11,65
350 FORT=1TO125:NEXT
360 POKES+4,64:POKES+11,64:POKE+18,64
370 READH1,L1,D1,H2,L2,D2,H3,L3,D3
380 POKES+1,H1:POKES,L1:POKES+8,H2:POKES
   +7,L2:POKES+15,H3:POKES+14,L3
390 POKES+4,65:POKES+11,65:POKES+18,65
400 FORT=1TOD1:NEXT
410 POKES+4,64:POKES+11,64:POKES+18,64
420 GOTO100
500 READH1,L1,D1,H2,L2,D2,H3,L3,D3
510 IFH1<0THENEND
520 POKES+1,H1:POKES,L1:POKES+8,H2:POKES
   +7,L2
530 POKES+15,H3:POKES+14,L3
540 POKES+4,65:POKES+11,65:POKES+18,65
550 FORT=1TOD3:NEXT
560 POKES+18,64
570 READH1,L1,D1,H2,L2,D2,H3,L3,D3
580 POKES+15,H3:POKES+14,L3
590 POKES+8,65
600 FORT=1TOD3:NEXT
```

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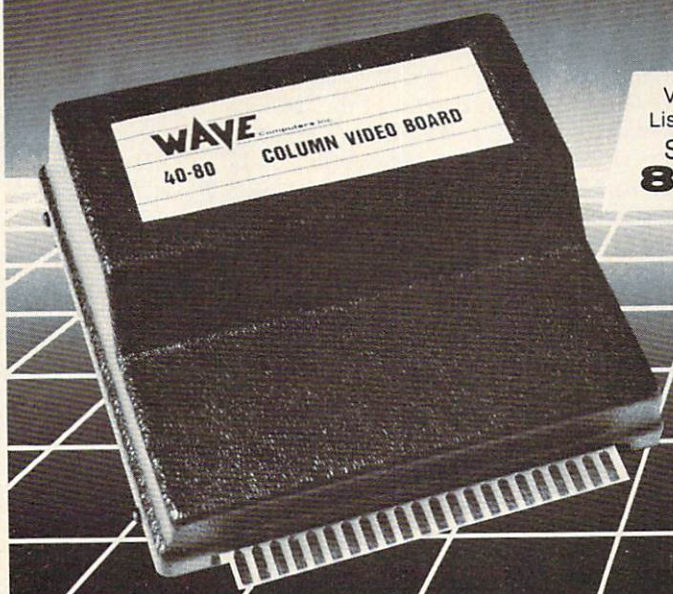

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```
610 POKES+18,64
620 READH1,L1,D1,H2,L2,D2,H3,L3,D3
630 POKES+15,H3:POKES+14,L3
640 FORT=1TOD3:NEXT
650 POKES+4,64:POKES+11,64:POKES+18,64
660 GOTO100
700 READH1,L1,D1,H2,L2,D2,H3,L3,D3
710 IFH1<0THENEND
720 POKES+1,H1:POKES,L1:POKES+8,H2:POKES
   +7,L2
730 POKES+15,H3:POKES+14,L3
740 POKES+4,65:POKES+11,65:POKES+18,65
750 FORT=1TOD3:NEXT
755 POKES+18,64
760 READH1,L1,D1,H2,L2,D2,H3,L3,D3
770 POKES+15,H3:POKES+14,L3
780 POKES+18,65
790 FORT=1TOD3:NEXT
800 POKES+4,64:POKES+11,64:POKES+18,64
810 READH1,L1,D1,H2,L2,D2,H3,L3,D3
820 POKES+1,H1:POKES,L1:POKES+8,H2:POKES
   +7,L2
830 POKES+15,H3:POKES+14,L3
840 POKES+4,65:POKES+11,65:POKES+18,65
850 FORT=1TOD1:NEXT
860 POKES+4,64:POKES+11,64:POKES+18,64
870 GOTO100
900 READH1,L1,D1,H2,L2,D2,H3,L3,D3
910 IFH1<0THENEND
920 POKES+1,H1:POKES,L1:POKES+8,H2:POKES
   +7,L2
930 POKES+15,H3:POKES+14,L3
940 POKES+4,65:POKES+11,65:POKES+18,65
950 FORT=1TOD3:NEXT
960 POKES+4,64:POKES+11,64:POKES+18,64
970 GOTO100
1000 DATAA,51,97,375,42,53,375,17,37,250
1010 DATA 0,0,0,   0,0,0,  21,154,250
1020 DATA 57,172,125,45,198,125,0,0,0
1030 DATA 51,97,250,43,52,250,25,177,250
1040 DATAB,43,53,750,34,75,750,17,37,250
1050 DATA0,0,0,0,0,0,21,154,250
1060 DATA0,0,0,0,0,0,25,177,250
1070 DATAA,51,97,375,42,53,375,17,37,250
1080 DATA0,0,0,0,0,0,21,154,250
1090 DATA57,172,125,45,198,125,0,0,0
1100 DATA51,97,250,43,52,250,25,177,250
1110 DATAB,43,53,750,34,75,750,17,37,250
1120 DATA0,0,0,0,0,0,21,154,250
1130 DATA0,0,0,0,0,0,25,177,250
1140 DATAC,76,252,500,45,198,500,12,216,
   250
1150 DATA0,0,0,0,0,0,16,47,250
1160 DATA76,252,250,45,198,250,19,63,250
1170 DATAB,51,97,750,45,198,750,12,216,2
   50
1180 DATA0,0,0,0,0,0,16,47,250
1190 DATA0,0,0,0,0,0,19,63,250
1240 DATAC,43,52,500,68,149,500,17,37,25
   0
1250 DATA0,0,0,0,0,0,21,154,250
1260 DATA43,52,500,68,149,500,25,177,500
1270 DATAB,51,97,750,43,52,750,17,37,250
```

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```
1280 DATA0,0,0,0,0,0,21,154,250
1290 DATA0,0,0,0,0,0,25,177,250
1300 DATAC,57,172,500,45,198,500,11,114,
   250
1310 DATA0,0,0,0,0,0,14,107,250
1320 DATA57,172,250,45,198,250,17,37,250
1330 DATAA,68,149,375,57,172,375,11,114,
   250
1340 DATA0,0,0,0,0,0,14,107,250
1350 DATA64,188,125,51,197,125,0,0,0
1360 DATA57,172,250,45,198,250,17,37,250
1370 DATAA,51,97,375,43,52,375,17,37,250
1380 DATA0,0,0,0,0,0,21,154,250
1390 DATA57,172,125,45,198,125,0,0,0
1400 DATA51,97,250,43,52,250,25,177,250
1420 DATAB,43,52,750,34,75,750,17,37,250
1422 DATA0,0,0,0,0,0,21,154,250
1424 DATA0,0,0,0,0,0,25,177,250
1430 DATAC,57,172,500,45,198,500,11,114,
   250
1440 DATA0,0,0,0,0,0,14,107,250
1450 DATA57,172,250,45,198,250,17,38,250
1460 DATAA,68,149,375,57,172,375,12,89,2
   50
1470 DATA0,0,0,0,0,0,14,107,250
1480 DATA64,188,125,51,97,125,0,0,0
1490 DATA57,172,250,45,198,250,17,38,250
1500 DATAA,51,97,375,43,52,375,17,37,250
1510 DATA0,0,0,0,0,0,21,154,250
1520 DATA57,172,125,45,198,125,0,0,0
1530 DATA51,97,250,43,52,250,25,177,250
1540 DATAB,43,52,750,34,75,750,17,37,250
1550 DATA0,0,0,0,0,0,21,154,250
1560 DATA0,0,0,0,0,0,25,177,250
1570 DATAC,76,251,500,64,188,500,12,89,2
   50
1580 DATA0,0,0,0,0,0,16,47,250
1590 DATA76,251,250,64,188,250,19,63,250
1600 DATAA,90,40,375,64,188,375,12,89,25
   0
1610 DATA0,0,0,0,0,0,16,47,250
1620 DATA76,251,125,64,188,125,0,0,0
1630 DATA64,188,250,0,0,0,19,63,250
1640 DATAC,68,149,750,51,97,750,17,37,25
   0
1650 DATA0,0,0,0,0,0,21,154,250
1660 DATA0,0,0,0,0,0,25,177,250
1670 DATAC,86,104,750,68,149,750,17,37,2
   50
1680 DATA0,0,0,0,0,0,21,154,250
1685 DATA0,0,0,0,0,0,25,177,250
1690 DATAA,68,149,375,43,52,375,17,37,25
   0
1700 DATA0,0,0,0,0,0,21,154,250
1710 DATA51,97,125,0,0,0,0,0,0
1720 DATA43,52,250,34,75,250,25,177,250
1730 DATAA,51,97,375,43,52,375,12,216,25
   0
1740 DATA0,0,0,0,0,0,16,47,250
1750 DATA45,198,125,38,126,125,0,0,0
1760 DATA38,126,250,32,94,250,19,63,250
1770 DATAD,34,75,1250,21,154,1250,17,37,
   1259
2000 DATAC,-1,-1,-1,-1,-1,-1,-1,-1,-1
```

REMs to Readers

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Most back issues are available in the original form. February and August 1982 are sold out and available in a reprint form. Due to the heavy demand, we suggest you order the back issues you want now while supplies last.

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READER SERVICE UPDATE

The response to *COMMANDER* Reader Service Cards has been fantastic thanks to your interest in our advertisers' products. The response was so overwhelming in fact, it became impossible to inform the advertisers of requests immediately. However, a new processing system is in effect and all requests should be answered before the next issue.

Readers may help keep this flow of information between advertisers and consumers constant by limiting requests to ten advertisements. We also ask that you continue to answer the questions on the card in order for *COMMANDER* to better serve you. If we may answer any questions about *COMMANDER* Reader Services, please contact us at

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Did you or your children attend one of the many "computer camps" last summer? *COMMANDER* Magazine is planning a spring report on the value and possible problems that may be part of this popular activity. You can help other *COMMANDER* readers make informed decisions by sending us a brief summary of the strengths and weaknesses of your experience, along with the following details:

1. age and sex of camper(s)
2. location and size of camp
3. software and hardware used
4. number of hours per day in computer instruction or labs
5. Sponsoring organization, if any
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We have a continuing need for publishable material that may be of interest to any segment of Commodore users, ranging from beginners to advanced programmers and technicians. If you've written an original program, or have an idea for a story about some computer application, product, or educational approach, please send us a manuscript or a letter of inquiry. We'd like to hear from younger writers as well as older ones.

Submitted materials should follow these guidelines;

1. Articles must be typed double-spaced, in upper and lower case on 8½ × 11 paper, with at least 1½ margins on all sides. Good quality printers may be used if the output is clear and dark. Two copies of each article should be included.
2. Programs must be provided in both hard-copy listing and machine-readable form (tape or disk). Where feasible, please include both C-64 and VIC-20 versions. If not accepted for publication, materials can be returned only if a SASE or adequate postage is enclosed.
3. On each page should appear your name, the title of the article, the date submitted, and the page number. Any accompanying listings, photos, graphs, etc., must be clearly identified.
4. In your cover letter, include a brief description of your relevant background and interests, the computer equipment you use, and the intended audience of your submission. Don't forget to give your address with both day and evening phone numbers.
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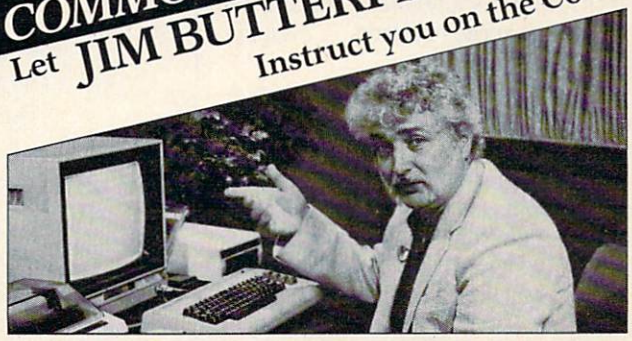

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The Pro Gram

By Jerry B. Byrd

"IS SCRIBBLING ONLY FOR CHILDREN?"

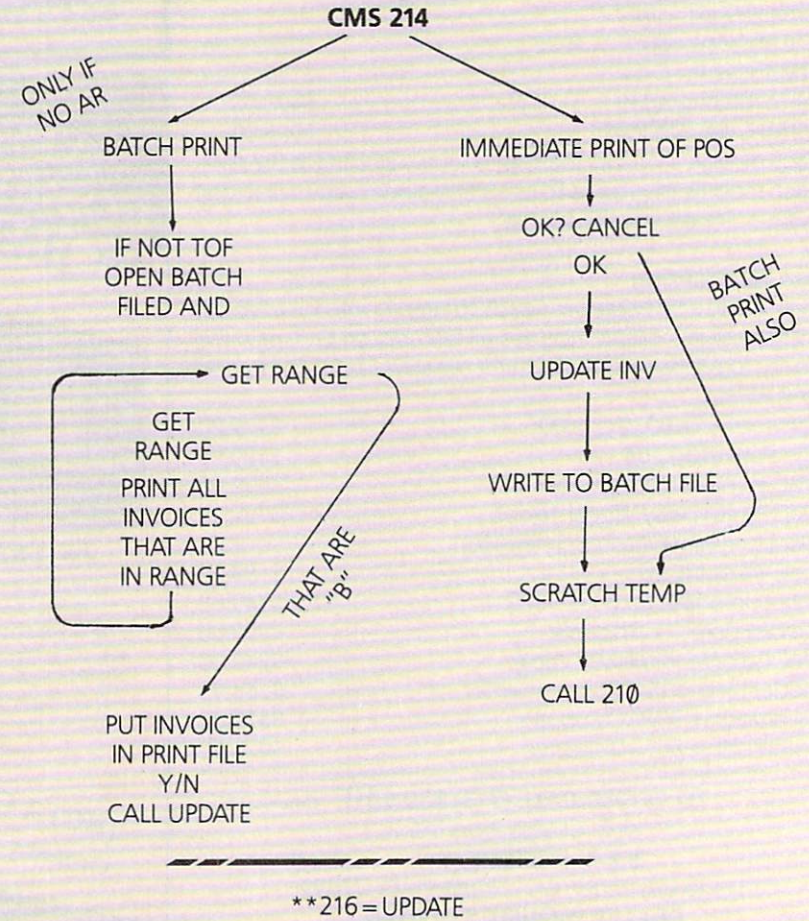
Flow charts represent the buzz words of buzz words. Perhaps some newcomers to the world of the computer are not familiar with it. Back in the dark ages of computerdom (the 1960's), almost every college or technical course began with flow charting. Now, many do not even address it in introductory courses. Rather, it is only for advanced students. I disagree with this philosophy.

What is a flow chart? What is its purpose? Why is it ever needed? When is it *not* needed?

A flow chart is nothing but a symbolic representation (a drawing) of an algorithm. An algorithm is a step-by-step solution to a problem. A computer program is often thought of as an algorithm, but in actuality it is a set of algorithms. This phase of problem solving is critical in making certain that all possible cases of response and circumstances are addressed in a program. I suppose the classic example of this is in the instructions given by a scoutmaster to his scouts: "If you are a good scout you will help little old ladies across the street." The instructions presuppose two conditions: 1) you are a good scout who helps people across the street, or 2) you are not a good scout and thus do not help people across the street.

One night at a meeting, little Johnny came in looking as if he had been in a fight with a bobcat and lost. The scoutmaster

Figure A



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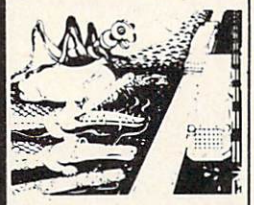

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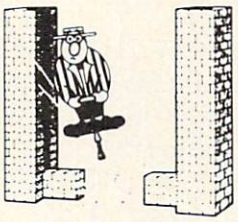

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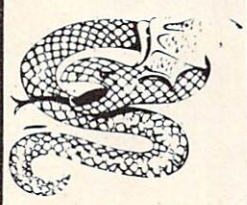

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asked what happened. Johnny indicated that he had been doing a good deed, and had helped a little old lady across the street. The scoutmaster asked if they had been hit by a car.

"No," replied Johnny, "the lady didn't want to go." Oftentimes, we write programs that "don't want to go." We forget one or two other conditions that need to be addressed. A flow chart usually helps to cover more of the possibilities. This is especially true of package programs written for the general public. There is absolutely nothing that will not be tried by users of a package. Ongoing software support is the acid test of a package. Our incoming calls reflect one of the extremes: either the user hasn't plugged in the computer or the circumstance is rather esoteric. Testing can never cover everthing.

Flow charting, by its very nature, will lead to better handling of the two biggest "bugs" in complex programs: extension errors and errors of magnitude. Every program should deal with what to do if too much (or too little) of something is done. It could be too many lines on an invoice, too many items in inventory, too few accounts on file, linked records not found, etc., etc. Usually one possibility is covered, but others are overlooked or not considered.

Entire books are written about flow charts and flow charting. My observation is that some, if not many or all, miss out on real world usefulness. I am not going to attempt to teach you how to draw or write a flow chart. Others can do it better than I. My desire is to encourage you to create a flow chart occasionally.

Flow charts may be formal, if used for a presentation. If a flow chart exists primarily to help you, then it certainly may be very informal. In Figure A, I have shown one of mine for a printing module I recently wrote. As you can see, it is informal, but it suited my needs. Seldom do I create a new program that I don't create something like this to speed me on my way.

The main purpose of the flow chart is to address the conditional branches. A conditional branch is a place in a program where the program takes different directions, according to some circumstance: Are you through? Is this the maximum? Is there a hardware or a media malfunction? Did the user make an illegal entry? Has everything been printed? Is the printer not there? Has this already been done?

When these kinds of things happen, it's often easy to forget to tidy up everything. In fact, last week I found a bug in the DOS (disk operating system) of the 1541 disk drive that probably would not have been

LISTING 1

```
0 REM 3-B
10 PRINTCHR$(147):GOTO1000
100 IF DP < 0 THEN DP = 2
110 N$=MID$(STR$(INT(N*10↑DP+.5)),2)
120 IFLEN(N$)<DP+1THENN$=RIGHT$("000000
    000"+N$,DP+1)
130 IFDP>0THENN$=LEFT$(N$,LEN(N$)-DP)+"
    ."+RIGHT$(N$,DP)
140 IFN<0THENN$="-"+N$
150 DP=-1:N=VAL(N$): RETURN
900 INPUT#15,E$,EM$,T$,S$:E=VAL(E$)
910 IFE<20THENRETURN
920 PRINTE$", "EM$", "T$", "S$
930 STOP
940 RETURN
1000 FOR I =1 TO 22:SP$ = SP$ + " ":NEX
    T:DP = -1
1010 CR$=CHR$(13)
4000 FOR I = 0 TO 9
4010 INPUT"NAME, GRADE";NA$(I),GR(I):NE
    XT
4020 PRINT LEFT$("STUDENT NAME"+SP$,15)
    ;RIGHT$(SP$+"GRADE",6)
4030 FOR I = 0 TO 9:N = GR(I):DP = 0:GO
    SUB100
4040 PRINT LEFT$(NA$(I)+SP$,18); RIGHT$
    (SP$+N$,3)
4045 TG=TG+N
4050 NEXT
4060 PRINTRIGHT$(SP$+"-----",21)
4070 N=TG/10:DP=2:GOSUB100
4080 PRINTRIGHT$(SP$+"AVERAGE",15);RIGH
    T$(SP$+N$,6)
5000 PRINT"STORE LIST (Y/N)";
5010 INPUTA$:A$=LEFT$(A$,1)
5020 IFA$="N"THEN5999
5030 IFA$<>"Y"THEN5000
5040 PRINT"TAPE OR DISK (T/D)";
5050 INPUTA$:A$=LEFT$(A$,1)
5060 IFA$<>"T"THEN5080
5070 OPEN3,1,1,"LIST":GOTO5120
5080 IFA$<>"D"THEN5000
5090 OPEN15,8,15:GOSUB900
5100 PRINT#15,"S0:LIST":GOSUB900
5110 OPEN3,8,3,"0:LIST,S,W":GOSUB900
5120 FOR I = 0 TO 9
5140 PRINT#3,NA$(I);CR$;GR(I);CR$;
5150 IFA$="D"THENGOSUB900
5160 NEXT
5170 CLOSE3:CLOSE15
5999 END
```

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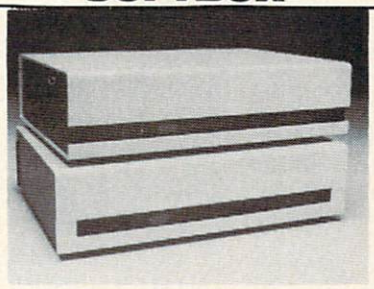

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there had flow charting taken place. (I'm sure this will elicit a response from someone on the job at Commodore that 50,000 pages of flow charting was done.) If you open a file to append information to it, and the disk cannot find a channel available for use, the DOS forgets to go back to the directory and tidy everything up. This leaves you with an open write file, one that cannot be fixed in any of the usual ways.

There are some things that flow charting will *not* help. I really wish it would improve my typing and cut down on syntax errors, but it doesn't. It will not assure you that you will *correctly* respond to an event. It does not usually address the method of ascertaining the occurrence of an event. Does your program, in fact, find out that the maximum number has been entered? Did you find out about the printer being turned off, etc.? For most programmers, learning all these tricks is the hardest part. My friend and partner, Chuck Stuart, is one of the few people creative enough to have figured most of these tricks out on his own. Most everyone else (myself included) hears about them from someone else. I never thought about it, but I guess someone does have to think about them first. I guess I thought Jim Butterfield always found them all.

Let me summarize by saying that I think programming will always be improved by having a pencil and paper handy while working. If nothing else, you can jot down that great idea for fixing another program, or the message from Aunt Matilda who called for your spouse.

Next session we'll continue to look at files as used by Commodore. I will try to give a little insight that may not be written elsewhere. We will also look at other kinds of files, although not directly supported by Commodore, that can be used on Commodore equipment.

PRACTICAL APPLICATIONS:

Retrieving Data Files

Last time we looked at files that can hold information: data files. The easiest data file to use on the Commodore family of computers is the sequential file. Next month in the Philosophy section we are going to look at files in detail and I will, at that time, look at turning this whole project into a random access file program that will let you change any item at will.

Listing 1 shows the listing of our program last time, as it finally ended up. I am going to make some changes and additions to give us the ability to retrieve the

LISTING 2

```
0 REM 3-C
2000 PRINT"[CLEAR]STUDENT GRADE EXAMPLE"
2010 PRINT"[DOWN][DOWN][REV]G[OFF]ET OLD
     NAMES"
2020 IFGF=0THENPRINT"[REV]E[OFF]NTER NAM
   ES":GOTO2040
2030 PRINT"[REV]E[OFF]DIT OLD NAMES"
2040 PRINT"[REV]S[OFF]AVE NAMES"
2050 PRINT"[REV]Q[OFF]UIT"
2100 GETA$:IFA$="E"THEN4000
2110 IFA$="G"THEN4100
2120 IFA$="S"THEN5000
2130 IFA$="Q"ANDGF=0THEN5999
2140 IFA$="Q"THENPRINT"[DOWN][REV]NAMES
   NOT SAVED[DOWN]":GOTO2010
2150 GOTO2100
```

LISTING 3

```
0 REM 3-D
4099 REM GET NAMES FROM TAPE
4100 PRINT"GET LIST? (Y/N)? Y[LEFT][LEFT
   ][LEFT]";
4110 INPUTA$:A$=LEFT$(A$,1)
4120 IFA$="N"THEN4290
4130 IFA$<>"Y"THEN4100
4140 PRINT"TAPE OR DISK? (T/D)? D[LEFT][
   LEFT][LEFT]";
4150 INPUTA$:A$=LEFT$(A$,1)
4160 IFA$<>"T"GOTO4180
4170 OPEN1,1,0,"LIST":GOTO4230
4180 IFA$<>"D"THEN4100
4190 OPEN15,8,15:GOSUB900
4200 OPEN3,8,3,"0:LIST,S,R":INPUT#15,E$,
   EM$:E=VAL(E$)
4210 IFE<>62THENGOSUB910:GOTO4230
4220 PRINT"[DOWN][REV]LIST FILE NOT FOUN
   D[DOWN]":CLOSE3:CLOSE15:GOTO4100
4230 FORI=0 TO 9
4240 INPUT#3,NA$(I):H=ST:IFA$="D"THENGOS
   UB900
4250 IFH=0THENINPUT#3,GR(I):H=ST:IFA$="D
   "THENGOSUB900
4260 IFH>0THENI=9
4270 NEXT
4280 GF=1:CLOSE3:CLOSE15
4290 GOTO2000
```

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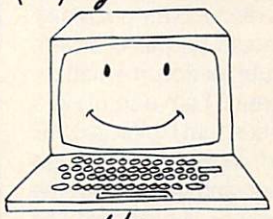

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data entered previously, change it, and then put it back on the tape or disk.

Listing 2 shows a new routine in the 2000 area. This is a menu. Every good program, I believe, should be menu driven. This is not a substitute for documentation, it just makes life easier. I am also using a new listing convention that I think you will find easier to read. Lines 2000 through 2050 clear the screen and then ask for the user's choice of options. Notice that line 2020 prints only if names have not been entered, either from a file (more on that later) or from the keyboard. The variable GF, get flag, will be zero if the program has just been entered or the names have been written to a file. Once names are entered, or read in, the variable is set to 1 to let us know this fact. By knowing this, we can either prompt to edit the names, which means we have some, or enter the names, which means we have none. This is a professional touch that will set your program apart from the pack.

Lines 2100-2150 get the user's desired action. If none of the possible choices are entered, then the program returns to line 2100. One word about the GET as used by Commodore. When the program hits a GET within a program, it goes immediately to the keyboard to see if a key is pressed, or has been pressed since it last looked. The computer can remember up to 9 keystrokes. If there is nothing out there in the keyboard buffer, the variable you are getting will be nothing. Nothing in computer lingo is a null (""). Once the computer arrives at the routine at 2100-2150, it will stay looping around until you rescue it by pressing an acceptable key, as checked in lines 2100-2140. Notice that lines 2130-2140 will not let the user exit until the names have been safely tucked away to tape or disk.

Listing 3 shows a routine for the 4100 area. These lines read in a file from tape or disk. These are very similar to the lines discussed last month in the 5000 area to store the names. Notice lines 4200-4220. These are making certain that the file exists. If it is not there, the user is informed.

How can you be sure that you have found the end of a sequential file? Easy. Just check the status flag, the system variable, ST, which we set to be equal to H in line 4240 immediately after reading the variable. This must be done immediately, for the computer uses ST for other things and it might change later. Like a train with a caboose at the end, so you will know when the train has finished passing, the last item read from a file has a flag, ST. When the last item comes by, the com-

LISTING 4

```
0 REM 3-E
10 GOTO1000
100 IF DP < 0 THEN DP = 2
110 N$=MID$(STR$(INT(N*10↑DP+.5)),2)
120 IFLEN(N$)<DP+1THENN$=RIGHT$("0000000
   00"+N$,DP+1)
130 IFDP>0THENN$=LEFT$(N$,LEN(N$)-DP)+".
   "+RIGHT$(N$,DP)
140 IFN<0THENN$="-"+N$
150 DP=-1:N=VAL(N$): RETURN
900 INPUT#15,E$,EM$,T$,S$:E=VAL(E$)
910 IFE<20THENRETURN
920 PRINT"[DOWN][REV]"E$", "EM$", "T$",
   "S$"[DOWN]"
930 CLOSE3:CLOSE15
940 GOTO2010
1000 FOR I =1 TO 22:SP$ = SP$ + " ":NEXT
   :DP = -1
1010 CR$=CHR$(13)
1020 FORI=0TO9:NA$(I)=" ":GR(I)=0:NEXT
2000 PRINT"[CLEAR]STUDENT GRADE EXAMPLE"
2010 PRINT"[DOWN][DOWN][REV]G[OFF]ET OLD
    NAMES"
2020 IFGF=0THENPRINT"[REV]E[OFF]NTER NAM
   ES":GOTO2040
2030 PRINT"[REV]E[OFF]DIT OLD NAMES"
2040 PRINT"[REV]S[OFF]AVE NAMES"
2050 PRINT"[REV]Q[OFF]UIT"
2100 GETA$:IFA$="E"THEN4000
2110 IFA$="G"THEN4100
2120 IFA$="S"THEN5000
2130 IFA$="Q"ANDGF=0THEN5999
2140 IFA$="Q"THENPRINT"[DOWN][REV]NAMES
   NOT SAVED[DOWN]":GOTO2010
2150 GOTO2100
4000 PRINT"[CLEAR]"
4002 FOR I = 0 TO 9
4004 PRINT"NAME":PRINT"? "NA$(I)"[UP]":N
   A$(I)=" "
4006 INPUTNA$(I)
4008 PRINT"GRADE":PRINT"?"GR(I)"[UP]":GR
   (I)=0
4009 INPUTGR(I)
4010 NEXT
4012 PRINT"[DOWN]PRESS RETURN TO SEE
4014 PRINT"NAMES DISPLAYED"
4016 GETA$:IFA$<>CR$THEN4016
4020 PRINT LEFT$("STUDENT NAME"+SP$,15);
   RIGHT$(SP$+"GRADE",6)
4030 FOR I = 0 TO 9:N = GR(I):DP = 0:GOS
   UB100
4035 IFNA$(I)=" "THEN4050
4040 PRINT LEFT$(NA$(I)+SP$,18); RIGHT$(
   SP$+N$,3)
4045 TG=TG+N:TS=TS+1
4050 NEXT
4060 PRINTRIGHT$(SP$+"-----",21)
```

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puter will set the flag to a number other than zero. In other words, as line 4250 says, if the status was 0, everything is okay to continue. Line 4260 stops the loop by pushing the counter to the end if, for some reason, the file didn't contain all the variables we thought it would, thus setting the flag early.

Line 4280 sets our "get flag" to show we now have names, closes our files, and then returns to the menu. Notice that in line 4240 we go to our subroutine at 900 only if we were reading our file from the disk.

Listing 4 shows the new program in final form. Since last time, I have changed lines 930 and 940 to make it work better. I have also changed line 10, deleting the clear screen, since the menu does that for us. I also added line 1020 to initialize our variables for use in the entry/edit area of lines 4000-4099.

The routine at 4000 has been changed to allow editing of previously entered data. I have used here, and also in lines 4100, 4140, 5000, 5040, a technique to allow all Commodore computers to input data that has already been entered.

Notice how I have used a shifted space. The computer recognizes that it is something (as opposed to the space, which it sees as nothing). Those using a PET or 8000 or SuperPET will note that you can hit return at a particular name entry and the machine will not stop. For C-64 and VIC users I set the name to a shifted space in line 4004 to make certain that if you erase an entry the name will be set to a shifted space. Otherwise, erasing the previous name from the screen and then pressing return would have changed nothing at all, due to the way these machines respond to the user pressing the return without entering something. One word for non-64 and non-VIC users: if you erase the name or press the space bar, there will be nothing for your machine to input and everything will stop. You can get around this by typing a shifted space if you erase everything.

I also changed the routine from 4050-4080 to print only the grades with some name, and then average just those. I did that in line 4035 by skipping the print and incrementation lines if the name was a shifted space.

Next month we will take this whole thing and let it become a random access file where we can call up any student we would like and see his or her name, last grade, total number of grades on file, and average.

```
4070 IFTS>0THENN=TG/TS:DP=2:GOSUB100
4080 PRINTRIGHT$(SP$+"AVERAGE",15);RIGHT
   $(SP$+N$,6)
4085 TS=0:TG=0:GF=1
4090 GOTO2010
4099 REM GET NAMES FROM TAPE
4100 PRINT"GET LIST? (Y/N)? Y[LEFT][LEFT
   ][LEFT]";
4110 INPUTA$:A$=LEFT$(A$,1)
4120 IFA$="N"THEN4290
4130 IFA$<>"Y"THEN4100
4140 PRINT"TAPE OR DISK? (T/D)? D[LEFT][
   LEFT][LEFT]";
4150 INPUTA$:A$=LEFT$(A$,1)
4160 IFA$<>"T"GOTO4180
4170 OPEN1,1,0,"LIST":GOTO4230
4180 IFA$<>"D"THEN4100
4190 OPEN15,8,15:GOSUB900
4200 OPEN3,8,3,"0:LIST,S,R":INPUT#15,E$,
   EM$:E=VAL(E$)
4210 IFE<>62THENGOSUB910:GOTO4230
4220 PRINT"[DOWN][REV]LIST FILE NOT FOUN
   D[DOWN]":CLOSE3:CLOSE15:GOTO4100
4230 FORI=0 TO 9
4240 INPUT#3,NA$(I):H=ST:IFA$="D"THENGOS
   UB900
4250 IFH=0THENINPUT#3,GR(I):H=ST:IFA$="D
   "THENGOSUB900
4260 IFH>0THENI=9
4270 NEXT
4280 GF=1:CLOSE3:CLOSE15
4290 GOTO2000
5000 PRINT"STORE LIST (Y/N)? Y[LEFT][LEF
   T][LEFT]";
5010 INPUTA$:A$=LEFT$(A$,1)
5020 IFA$="N"THEN5180
5030 IFA$<>"Y"THEN5000
5040 PRINT"TAPE OR DISK (T/D)? D[LEFT][L
   EFT][LEFT]";
5050 INPUTA$:A$=LEFT$(A$,1)
5060 IFA$<>"T"THEN5080
5070 OPEN3,1,1,"LIST":GOTO5120
5080 IFA$<>"D"THEN5000
5090 OPEN15,8,15:GOSUB900
5100 PRINT#15,"S0:LIST":GOSUB900
5110 OPEN3,8,3,"0:LIST,S,W":GOSUB900
5120 FOR I = 0 TO 9
5140 PRINT#3,NA$(I);CR$;GR(I);CR$;
5145 NA$(I)=" ":GR(I)=0
5150 IFA$="D"THENGOSUB900
5160 NEXT
5170 CLOSE3:CLOSE15:GF=0
5180 GOTO2000
5999 END
```

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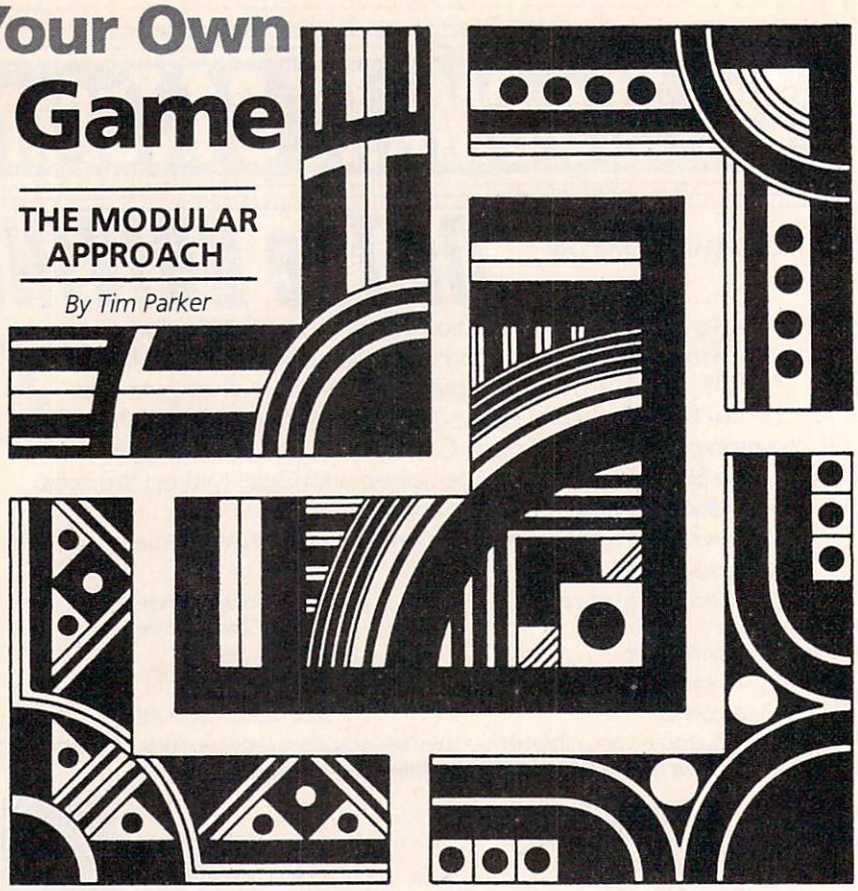
Programming Your Own Adventure Game

THE MODULAR APPROACH

By Tim Parker



Of all the computer game types, one of the most addicting is the adventure game. Adventure games for the purposes of this discussion will be limited to text style games. In these, typically, the computer describes your surroundings to you, and you then enter a one-or two-word command. The computer interprets the command and takes appropriate action. Although in the last few years a large number of adventure games have been appearing with graphics, these generally are somewhat more restricted in variations of play than a straight text game.

When Crowthers and Woods wrote the original adventure game on a mainframe system (sometimes referred to as the "Colossal Cave" adventure), they could not have foreseen the tremendous response it received. Since then, this game has been reincarnated for almost every computer known, and in almost every language.

Other people got in on the act, and a series of more fully developed games began to appear. Games in the "Zork" series still are tremendously popular, and the appearance of games designed by Scott Adams has helped increase the potential of the medium.

Although the programming behind an adventure game is not difficult, it does require considerable advance planning. When an expansion is considered, a reworking of some of the old material is usually required. An alternative is to use the "modular approach" to the adventure game design.

The modular approach requires no preplanning, and can be changed with a minimum of effort by a programmer. It has one major problem, however, and that is memory usage. (This can be overcome to some extent by using chaining of programs. More on that later.)

CONVENTIONAL PROGRAMMING OF ADVENTURE GAMES

Before describing the modular system, it will be useful to take a look at the usual method of programming adventure games in order to appreciate the differences. Most adventure games have two components, an "action" section, and a "data" section. The data section is easy to understand. It consists of a series of lines that are descriptions of the areas an adventurer will encounter. These are called up by the program when needed. For example, one of the data lines may read "You are in a large cave, with piles of dust covering the floor. On the west wall is a mirror. Exits are visible to the north and south." When an adventurer moves into that particular location in the adventure universe (the space taken up by the adventure game), the computer runs through the data files until it locates some marker that tells it that the room entered corresponds to the location. It then pulls the description from the files, and prints it on the screen.

The data file is usually quite big. The original adventure consisted of many rooms, and has been expanded to over two hundred and fifty. All that is stored in the data file are these descriptions of locations (with some system to allow the computer to get the correct one for each location), and perhaps some details of monsters, objects, or features that can be encountered randomly. For example, one section of the data file may consist of treasure information, such as "a gold crown", "a silver sword", etc. Another section may have the nasty types encountered in the adventure (after all, what fun is it without some nasties?) such as "a large green slime mold", or "a three headed giant mouse".

Also stored in some data areas are the messages that may have to be displayed at certain times, although some games include these in the program area. Examples are "I don't understand what you want to do.", or "You can't do that!!". These would be accessed when needed by the program control section.

The other section in a typical adventure game is the program itself. This is the routine that will loop to the required data area, analyze responses, figure ratios, move monsters, etc.

The program area has to be divided again into sections. The most important is the response analysis section. This takes an instruction from the player and determines exactly what should be done. If the player says "MOVE WEST", the program should send the description of the next area to the west back to the screen.

These instructions are analyzed by a series of IF statements (in BASIC). For example, a few lines of the program may read:

```
1000 IF LOCATION = 12 AND
  TREASURE1 = 0 THEN PRINT "There
  is gold!"
1010 IF LOCATION = 12 AND
  TREASURE2 = 0 THEN PRINT "There
  is silver!"
1100 IF LOCATION = 12 AND
```

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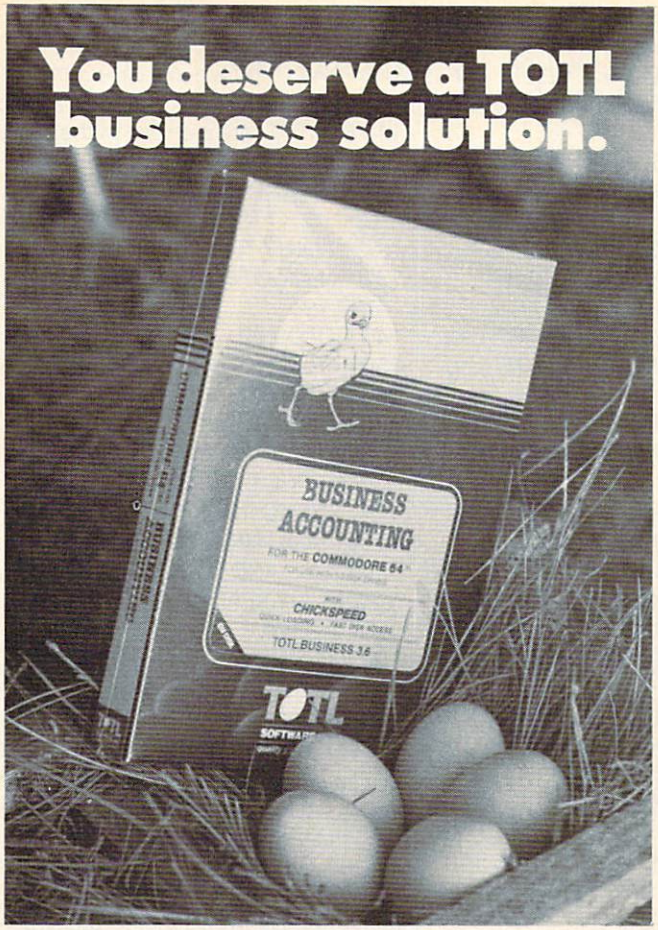

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```
MONSTER1 = 0 THEN PRINT "There
  are pirates!"
```

In these examples, the first two lines decide whether the adventurer is in a certain room represented by a variable LOCATION. If the adventurer has not picked up the treasure that could exist there, it will be shown by a value of zero in the variables TREASURE1 and TREASURE2. Therefore, if the location is correct, and the treasure has not been picked up, the computer will display a message that says the treasure is there. In the last line, if the location corresponds and a monster has not been encountered before (and therefore the variable MONSTER1 is assigned a value of zero), it will print a message to that effect.

Obviously the above three lines of code are very rudimentary. In truth, the control sections are organized for maximum speed and efficiency, with many variables being checked for their values. Also, simple messages will probably be accessed by looping into the data file. For example:

```
2000 IF LOCATION = 12 THEN PRINT
  LOCDESC12
```

In other words, if the location is assigned as 12, then the variable LOCDESC12 (location description for room 12) is printed. These descriptions will have been loaded in from the data area.

Although this approach does allow some flexibility, the variables should all be assigned during the programming, and changes are difficult, as the program area has to be reaccessed, and alternate instructions added. If a simple language such as BASIC is being used, this can lead to congestion and confusion.

USING THE MODULAR DESIGN METHOD

The modular approach requires a separate section of code for each possible action an adventurer could take in a situation, and a loop to a new location if required. One of the nice things about a modular approach is that the programming can be done more easily in an unstructured language such as BASIC than in a more structured language.

The modular approach employs two subsections. The first is the response analysis routine, similar to the approach indicated above, except that the resulting action can be stored to a variable. An example is:

```
1000 REM ADVENTURER RESPONSE
  ANALYSIS (SIMPLIFIED)
1010 PRINT "WHAT DO YOU WANT
  TO DO?"
1020 INPUT RESPONSE$
1030 IF RESPONSE$ = "WEST" OR
  RESPONSE$ = "MOVE WEST" THEN
  ACTION = 1
1040 IF RESPONSE$ = "EAST" OR
  RESPONSE$ = "MOVE EAST" THEN
  ACTION = 2
1050 IF RESPONSE$ = "NORTH" OR
  RESPONSE$ = "MOVE NORTH"
  THEN ACTION = 3
1060 IF RESPONSE$ = "SOUTH" OR
  RESPONSE$ = "MOVE SOUTH"
  THEN ACTION = 4
1070 IF RESPONSE$ = "UP" OR
  RESPONSE$ = "MOVE UP" THEN
  ACTION = 5
1080 IF RESPONSE$ = "DOWN" OR
  RESPONSE$ = "MOVE DOWN"
  THEN ACTION = 6
1100 IF LEFT$(RESPONSE$,3)<> "GET"
  THEN GOTO 1200
1020 REM AND ASSIGN A VALUE OF
  ACTION...
.1030 REM AN ALTERNATIVE IS TO DO
  THIS IN THE CAVE
1040 REM DESCRIPTIONS THEMSELVES
1100 IF RESPONSE$ = "EAT" THEN
  ACTION = 10
1110 IF RESPONSE$ = "DRINK" THEN
  ACTION = 11
1120 REM ETC.....
```

and so on. In this way, a variable called ACTION will contain the instruction the computer should consider. This analysis section should cover the majority of simple commands that occur in the adventure. (If an instruction occurs only in one cave, for example, then the analysis routine could be included in the cave's details.)

Each location in the adventure has its own code area assigned in the modular adventure game. Thus, location 1 may occupy code from lines 100 to 199, location 2 from 200 to 299, location 10 from 1000 to 1099, etc. This is the modularization that the title refers to. In this way, if an adventurer is in cave 12 and has to go to cave 11 due to a "WEST" command, in the above analysis section the variable ACTION will contain the value of 1, and in the location 12 section, the loop:

```
IF ACTION = 1 THEN GOTO 1100
```

could be included.

The obvious advantage to this is that if you wish to expand the adventure later you simply add in the new caves at their respective line numbers, and add references to the new materials where required.

In each cave's description, the use of multiple IF statements would be slow and tedious. A much better approach is the ON statement:

```
100 PRINT "You are in a cave 3 metres
  by 4 metres."
110 PRINT "There is an exit to the west,
  and a tunnel to the east."
120 GOSUB 15000: REM ***THIS
  LOOPS TO THE INPUT ANALYSIS
  SECTION***
130 ON A GOTO 140,150,160,170,
  180,190
140 GOTO 200
150 GOTO 400
160 GOTO 700
170 IF RIGHT$(RESPONSE$,4) =
  "FOOD" AND FOOD1 = 0 THEN
  PRINT "GOT THE FOOD.": FOOD1
  = 1:GOTO 1000
175 IF RIGHT$(RESPONSE$,4) =
  "FOOD" AND FOOD1 = 1 THEN
  PRINT "ALREADY GOT IT!":
  GOTO 100
180 PRINT "THERE IS NOTHING TO
  SHOOT AT!":GOTO 100
190 PRINT "YOU CAN'T DO THAT
  HERE!":GOTO 100
```

In the above code, which has been simplified for illustration purposes, the variable ACTION is used by the ON statement in line 130 to loop to lines 200 if moving WEST, lines 400 if moving EAST, lines 700 if moving UPWARDS, analyze to see if food has been received, if the command GET FOOD was issued (note the two cases), to respond negatively if the command SHOOT was given, and to print a message if nothing else is relevant in that section of cave.

As stated, the above does nothing to illustrate the complexity, as very trivial examples are used. However, if thought out, a cave section could be written that will allow all circumstances to be considered.

In a modularized game, it is also possible to add certain features to a location. If we wanted to have a giant spider inhabit a cave at a certain location, then the following lines could be included:

```
1560 IF RND(X)< .5 THEN GOTO 1500
1570 PRINT "A GIANT SPIDER DROPS
  ON YOU FROM THE ROOF!"
1580 REM ***ANALYZE RESPONSE
  TO SPIDER HERE***
```

Line 1560 gives a fifty percent chance the spider will drop. If it doesn't, the routine is sent back to the location description. If it does, the adventurer will be given a chance to fight, or take the consequences.

In such a way, several caves can be constructed easily. If they are virtually identical, it is possible to take advantage of the Commodore machine's on-screen editing, and create a standard routine. Sup-

pose we have three caves in a row, all with exits to the east and west. If, in the input analysis section, a move to the east results in a value of 1 being assigned to the variable ACTION and a move to the west results in a value of 2, then a simple cave would be programmed as follows:

```
500 REM CAVE #5
501 PRINT "YOU ARE IN A ROUGHLY
    HEWN CAVE 3 METRES BY 3
    METRES"
502 PRINT "THERE ARE EXITS TO THE
    EAST AND WEST."
510 GOSUB 15000: REM LOOPS TO
    INPUT SECTION
520 ON ACTION GOTO 530,540,550,
    550,560
525 REM GOTO SECTIONS FOR
    ACTION = 1,2,3,4 and ACTION 4
530 GOTO 400: REM GOTO CAVE #4
    TO THE EAST
540 GOTO 600: REM GOTO CAVE #6
    TO THE WEST
550 PRINT "THERE'S ONLY A CAVE
    WALL IN THAT DIRECTION!":
    GOTO 500
560 PRINT "YOU CAN'T DO THAT
    HERE!": GOTO 500
```

Once this cave was LISTed on the screen, the programmer could use the full-screen editing to change the line numbers to 400's or 600's (and change the references, of course) to build up a dungeon rapidly.

This type of description for each area in the adventure comprises the data details that, together with the input analysis routine, will provide a complete, working adventure game.

CHAINING

One of the major drawbacks of this approach is the amount of memory required. As there is a lot of repetition in the programming, it does occupy quite a large chunk of the computer's available RAM. An obvious solution is to CHAIN programs, which is one advantage this method of game programming has over the structured version. At some point in the adventure, have the victim(s) fall into a crevice, pass through a door that locks behind them, or teleport them somewhere where the old caves no longer are required. A new routine with a similar input routine but different cave descriptions can then be called up from the cassette tape or disk drive. In this method, there is virtually unlimited size to the dungeons.

With a cassette, it is best to have the cave programs in sequential order so the player doesn't have to touch the tape deck. With a random-access disk the order is less important. In either case, the LOAD commands can be made part of your program.

SHOULD YOU TRY IT?

How well does the modular approach work? That depends on what you are looking for in the game design process. Obviously, this approach takes much less planning than the structured versions, but also occupies many times the space in memory. The way around that, as just described, is easy. As far as convenience for the programmer, the modular approach wins hands down. Not only can the game be played at various stages of completion, as long as the input routine is written, but changes are easy, and future expansion is just as simple.

While the modular approach may not be to everyone's tastes, it does fill a need in the programming community. It provides an excellent way for relatively new programmers to begin adventure game design.

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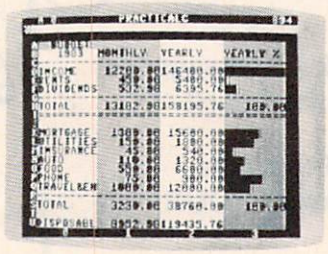

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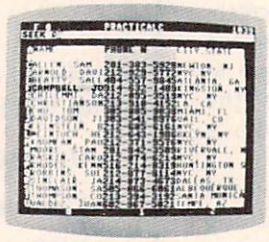

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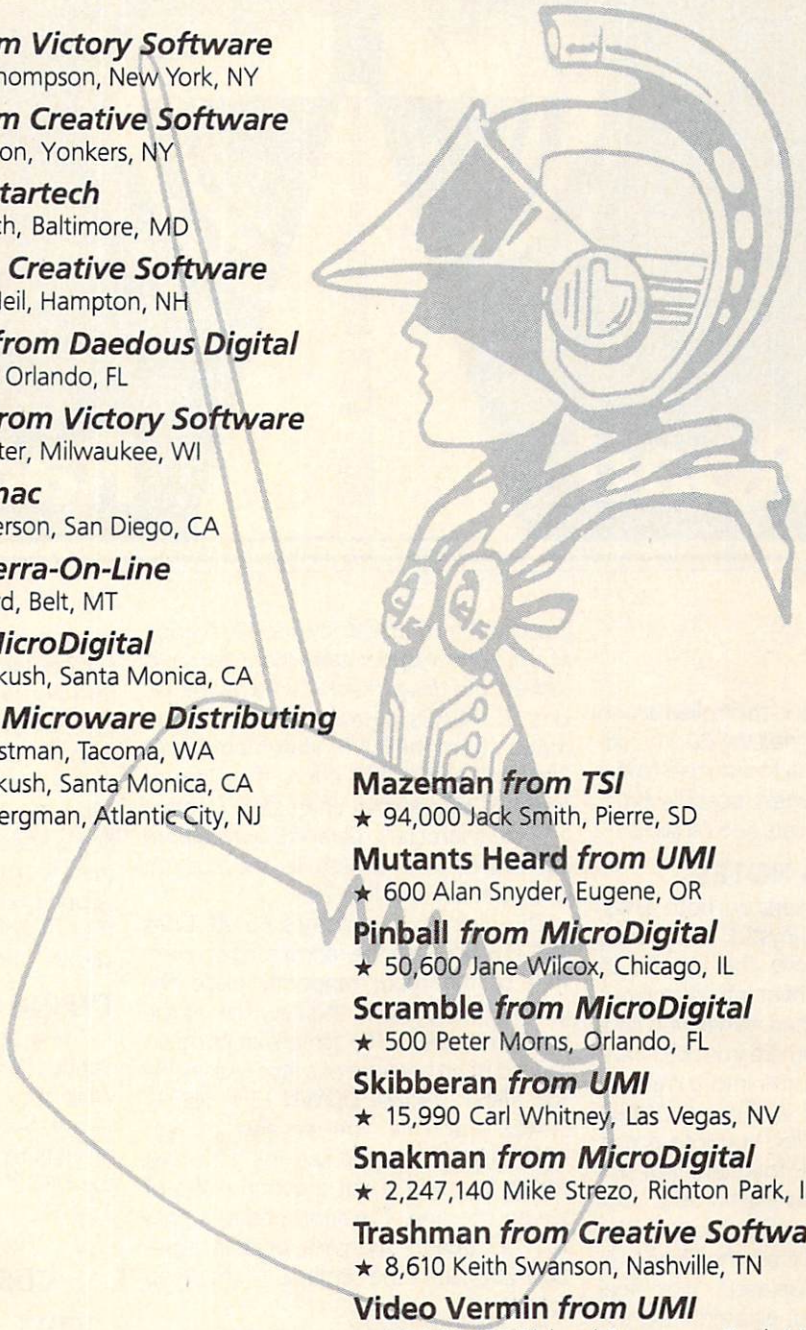

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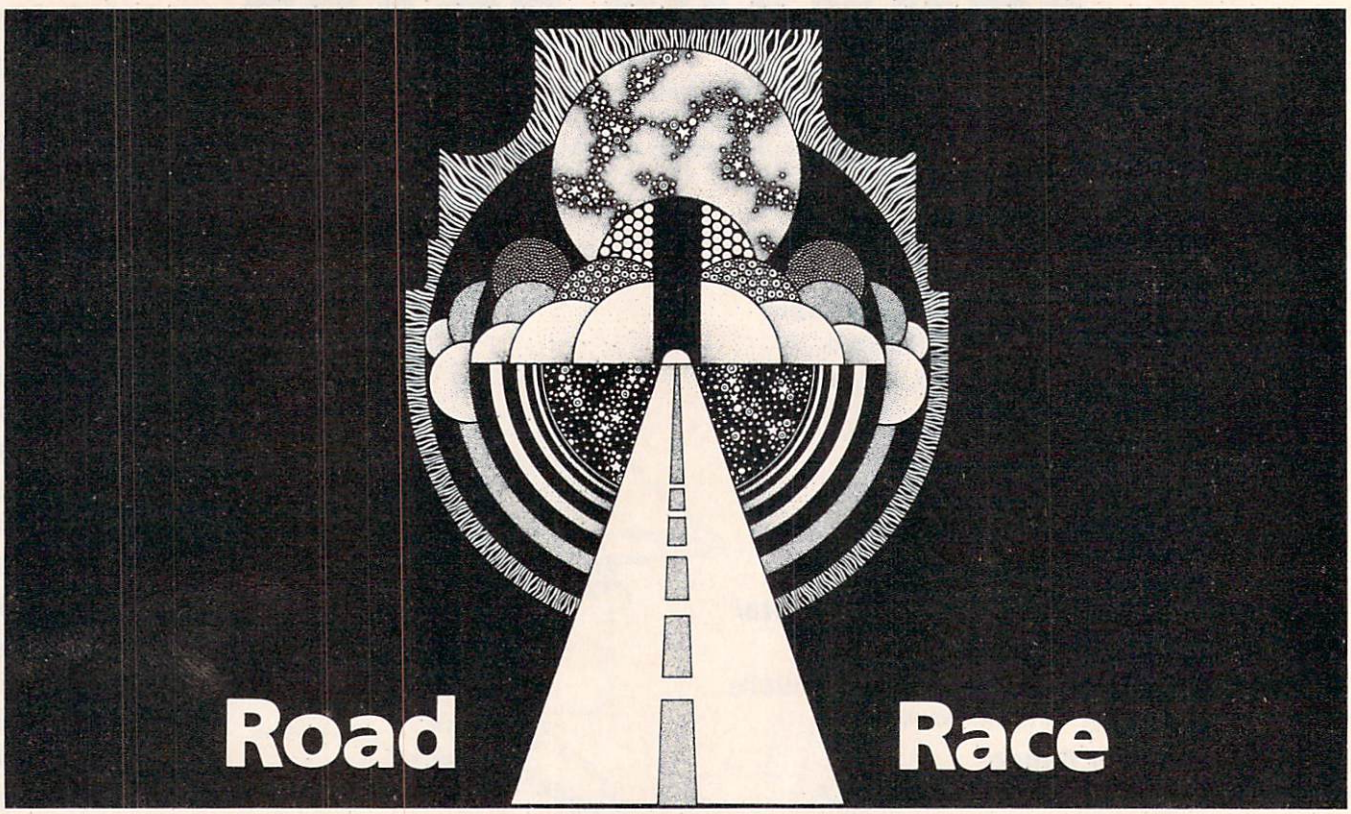

By Cal Overhulser

Road Race is a joystick-controlled action game for the unexpanded VIC 20. The object is to speed down a forest road to the finish line in the shortest possible time, while avoiding other cars and oil slicks.

GAME PLAYING NOTES

The road has markers on both sides. Push forward on the joystick to start the car moving, and move the joystick to either side to steer right or left. Watch out for obstacles on the road. When you hit a road edge marker, you are knocked back onto the road. If you run into a car, you crash, lose time, and lose points. When you run into an oil slick, you lose points and go out of control. There are four skill levels with level four as the hardest. Your elapsed time is shown continuously on the screen and when you cross the finish line, your final score is displayed. Your final score is passed on your elapsed time, the number of collisions and how many times you bounced off the edge of the road.

PROGRAM NOTES

To fit the program in the unexpanded VIC, I had to remove all REM Statements but the following notes should help you track the program logic. Lines 10-33 are housekeeping activities. Upper RAM is protected from BASIC by line 10. A copy of the normal upper case character set is moved into this protected area by line 17. Line 22 READs custom character information from the DATA statements (lines 700-740) and POKEs it into the place of some of the normal characters (Table 1 lists the characters replaced with custom characters). The switch to the custom character set is in line 29.

The main loop is in lines 55-99. Lines 100-176 calculate the random right or left shift of the road, randomly place the obstacles, and PRINT the new row at the top of the screen. The screen scrolls down instead of up because of a little trick in line 160 PRINT "HOME DOWN LEFT INSERT SPACE" scrolls the screen down. POKE218,158 tells the line link table that screen line two is not a continuation of screen line one. The subroutines in lines 191-193 update the car's location. Lines 200-298 are the collision checking routine.

The joystick condition is checked to be processed twice as fast as it could be in BASIC. It is contained in the DATA statements and POKEd into the cassette buffer by line 20. Line 60 calls the routine with SYS828. The joystick condition is returned to address zero. The ON/GOSUB . . . in line 62 checks the joystick condition in memory address zero and goes to the appropriate subroutine to update the current location of the race car. Having the joystick condition returned in address zero allows this location to be POKEd with direction information when the race care is out of control. I do this in line 66 when the bounce is calculated after hitting a road edge marker. The flag OS is then set to cause line 60 (the SYS) to be skipped. Our out of control direction is then sampled in line 62 as though it were joystick information.

TYPING NOTES

The program will 'just fit' in the unexpanded VIC, so *don't add any spaces* while typing the program. To make the typing go faster try using keyword abbreviations (see 'Personal Computing On the VIC 20', Appendix D, supplied with your VIC).

TABLE 1: CUSTOM CHARACTERS

SCREEN CODE	ORIGINAL CHARACTER	CUSTOM CHARACTER
33	!	race car front
34	"	race car rear
35	#	crashed car front
36	$	crashed car rear
37	%	obstacle car rear
38	&	obstacle car front
39	'	oil slick
40	(	tree top
41	)	tree bottom

```
10 POKE52,28:POKE56,28:PRINT"[CLEAR][DO
   WN][DOWN][DOWN][DOWN][DOWN][DOWN]"
14 PRINT"[DOWN][YELLOW]******[REV]ROAD
   RACE[OFF]*******[DOWN][DOWN][CYAN] *
   [REV]BY CAL OVERHULSER[OFF]*  [DOWN]
   [DOWN]  *[REV]WESTFORD, MASS.[OFF]*
17 PRINT:FORI=7168TO7679:POKEI,PEEK(256
   00+I):NEXT
20 FORI=828TO915:READA:POKEI,A:NEXT
22 FORI=7168+33*8TO7168+41*8+7:READA:PO
   KEI,A:NEXT
25 GOSUB300:A$(0)="))))))))[RED]      [
   GREEN])))))))":A$(1)="(((((((([RED].
      .[GREEN](((((((":W=9
27 P1=1:P2=2:P3=3:P4=4:P5=5:P6=6:Q1=21:
   Q2=22:Q3=23:Q4=135:V=36878:SN=36877:
   SL=36874
29 Q5=199:Q6=210-A:SC=7680:CM=38400:POK
   E36869,255:PRINT"[CLEAR]":CL=SC+297-
   22*A
30 FORI=1TO11:FORJ=0TO1:PRINT"[GREEN]"A
   $(J):LC=LC+1:IFLC=12-ATHENGOSUB410
32 IFLC=Q1THEN50
33 NEXT:NEXT
50 POKECL,33:POKECL+Q2,34:POKECM-SC+CL,
   3:POKECM-SC+CL+Q2,3:SYS828:IFPEEK(0)
   =0THEN50
52 IFF4=0THENTI$="000000"
53 F4=0
55 IFOS<>0THENOS=OS-P1:GOTO62:REM SKID
60 SYS828
61 POKESL,Q4:POKEV,P5:POKESN,0
62 F3=0:TL=CL:LA=CL:F1=0:ONPEEK(0)GOSUB
   230,191,191,230,230,230,193,193
63 IFF1=0THENF1=P1:LA=LA-Q2
65 FORI=0TOQ2STEPQ2:Q=PEEK(LA+I)-36:GOS
   UB200:NEXT
66 IFF3<>0THENPOKE0,3+-(F3=P1)*4:CL=TL:
   PC=PC+P1:GOTO55
70 GOSUB100:POKECL,31+P2*F1:POKECL+Q2,3
   1+P2*F1+P1:POKECM-SC+CL,P3:POKECM-SC
   +CL+Q2,P3
71 PRINT"[BLACK][HOME] TIME:  "MID$(TI$,
   3,2)":"RIGHT$(TI$,2)"          ":IFLC
   =Q6THEN450
80 IFF4THENFORI=15TO0STEP-.02:POKEV,I:N
   EXT:POKESN,0:OS=0:GOTO50
99 GOTO55
100 IFF2=P1THEN110
105 Z=INT(RND(1)*P2):Y=INT(RND(1)*P2)
110 IFY=P1THEN140
120 B$=RIGHT$(A$(F2),Z)+LEFT$(A$(F2),Q3
   -Z):W=W+Z/P2:IFW>14THENW=14:GOTO155
130 GOTO150
140 B$=RIGHT$(A$(F2),Q3-Z)+LEFT$(A$(F2)
   ,Z):W=W-Z/P2:IFW<P3THENW=P3:GOTO155
```


!wow!

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Circle No. 47

```
150 A$(F2)=B$
155 B$="":POKETL,32:POKETL+Q2,32
160 PRINT"[HOME][GREEN][DOWN][LEFT]■ ";
    :POKE218,158:PRINTA$(F2):LC=LC+P1
165 IFF2=0THENF2=P1:RETURN
170 IFLC=Q5THENGOSUB410:GOTO176
171 Q=INT(RND(1)*P2):R=INT(RND(1)*P4):R
    1=INT(RND(1)*P2):IFQ<>P1THEN176
173 POKESC+Q2+W+R,39-R1:POKECM+Q2+W+R,P
    6-R-R1
174 IFR1=P1THENPOKESC+Q2+Q2+W+R,37:POKE
    CM+Q2+Q2+W+R,P6-R-R1
176 F2=0:RETURN
191 F1=P1:CL=CL+P1:LA=LA-Q1:RETURN
193 F1=P1:CL=CL-P1:LA=LA-Q3:RETURN
200 IFQ<0THENQ=0
210 ON0GOSUB293,295,297,298,298,230,230
    ,230,230,298
230 RETURN
293 F4=P1:F1=P2:POKESN,255:IFI=0THENPOK
    ELA-Q2,32:POKELA,32
294 RETURN
295 F4=P1:F1=P2:POKESN,255:IFITHENPOKEL
    A+44,32:POKELA+Q2,32
296 RETURN
297 OS=P5:POKESL,Q4:POKEV,P5:RETURN
298 OS=P1:EC=EC+P1:F3=P1:IFPEEK(CL-P2)=
    40ORPEEK(CL-P2)=41THENF3=-P1
299 POKEV,15:POKESL,184:F1=P2:RETURN
300 PRINT"[RED]ENTER SKILL LEVEL 1-4"
305 GETA$:IFA$=""THEN305
310 A=VAL(A$):IFA<1ORA>4THEN300
315 A=2*A:RETURN
410 PRINT"[BLACK]----------------------"
    :RETURN
450 PRINT"[HOME][DOWN][BLACK] SCORE "IN
    T(999-(TI/60-60)*10-EC*10-PC*50)*A"[
    LEFT]    ":POKEV,0:RUN25
600 DATA173,19,145,72,173,34,145,72,169
    ,0,133,0,133,1,169,127,141,34,145,17
    3,32
610 DATA145,73,255,41,128,42,8,169,195,
    141,19,145,173,17,145,73,255,41,60,7,4
620 DATA74,40,42,168,41,16,201,16,208,2
    ,133,1,152,41,15,162,0,232,224,9
630 DATA240,7,221,139,3,208,246,134,0,1
    04,141,34,145,104,141,19,145,96
640 DATA0,2,3,1,5,4,12,8,10
700 DATA24,189,255,189,52,36,52,118,118
    ,227,255,255,189,60,60,24
710 DATA8,4,46,184,240,232,170,47,110,7
    0,126,29,111,247,245,96
720 DATA60,60,189,255,255,189,60,24,24,
    189,255,189,60,60,60,60,10,85,170,85
    ,170,84,40,0
740 DATA0,16,56,56,124,124,254,254,254,
    254,16,16,16,16,16,0
```

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Continued from page 49

LISTING 1

```
1 REM TIMES TABLES
2 REM VIC VERSION
3 :
4 PRINT"■"SPC(201)"*TIMES  TABLES*"SPC(72)"BY ANDY VAN DUYNE"
5 GOSUB700:GOSUB700
7 PRINT"■■TOUCH A KEY..."
8 GETA$:IFA$=""THEN8
10 X=RND(-TI)
20 DIM P%(100,2)
30 POKE36878,15:GOSUB750
100 REM *SET PROBLEMS*
102 PRINT"■■■■SETTING UP PROBLEMS..."
105 FORN=1TO10:FORZ=1TO10
110 R=INT(RND(1)*100)+1
112 IFP%(R,1)=0ANDP%(R,2)=0THENP%(R,1)=Z:P%(R,2)=N:GOTO120
115 GOTO110
120 NEXTZ,N
130 FORN=1TO100:P%(N,1)=P%(N,1)-1:P%(N,2)=P%(N,2)-1:NEXT
200 FORN=1TO100
210 GOSUB600
215 PR=PR+1:IFPR=TZANDN<100THENPR=0:GOSUB800
220 NEXT
240 PRINT"■■THAT'S 100 PROBLEMS...":GOSUB520
242 IFWR=0THENPRINT"■■YOU GOT THEM ALL RIGHT■!!!!!!!!!!!!!!!!!!!!!!":GOSUB520:GO
TO1000
245 PRINT"■YOU GOT"100-WR"CORRECT":PRINT"■LET'S REVIEW THOSE YOU MISSED..."
250 PRINT"■TOUCH ■RETURN■"
255 GETA$:IFA$<>CHR$(13)THEN255
300 REM*RETRY WRONG*
305 Z=WR:WR=0
310 FORN=1TOZ
320 GOSUB600
330 NEXT
340 PRINT"■■ALL DONE WITH THESE■"
350 IFWR=0THENPRINT"YOU GOT THEM ALL THIS       TIME!":GOSUB520:GOTO1000
360 GOSUB700:GOSUB700:PRINT"■YOU STILL NEED TO WORK  ON THESE:■■"
370 FORN=1TOWR
375 PRINTP%(N,1)"X"P%(N,2)"=";
380 GOSUB700
385 PRINTP%(N,1)*P%(N,2)
389 GOSUB700
390 GOSUB700:NEXT
395 GOTO1000
500 REM*RIGHT ANS*
502 FORS=1TO3:FORZ=150TO240STEP10:POKE36876,Z:NEXTZ,S:POKE36876,0:RETURN
520 REM *WHOLE SECT.*
522 FORS=1TO5:FORZ=250TO190STEP-2:POKE36876,Z:NEXTZ,S:POKE36876,0:RETURN
600 REM SHOW PROBLEM
601 PRINT"■■ ┌──────────┐"
602 PRINT"■!■NUMBER"N;TAB(12)"■■!"
603 PRINT" └──────────┘"
605 PRINT"■■■■■■■■■■■■":PRINTTAB(6)"■          ":PRINTTAB(6)"■          ■"
606 PRINT"■"TAB(7)P%(N,1)"X"P%(N,2)
607 PRINTTAB(6)"■          ■"
650 REM *GET ANSWER*
652 PRINT"■■"TAB(8):AN=-1:INPUTAN
655 IFAN=P%(N,1)*P%(N,2)THENGOSUB500:RETURN
660 PRINT"■NO, THAT'S NOT IT."
665 WR=WR+1:P%(WR,1)=P%(N,1):P%(WR,2)=P%(N,2)
670 GOSUB700
675 RETURN
700 FORP=1TO1E3:NEXT:RETURN:REM *DELAY*
750 TZ=INT(RND(1)*8)+10:RETURN
800 REM *TIME OUT*
802 PRINT"■":GOSUB750
805 READPI,T:IFPI=-1THENPRINT"■■■TIME IN!":GOSUB700:RESTORE:RETURN
807 POKE646,RND(1)*6+2:PRINT"■TIME OUT-";
810 POKE36876,PI:FORP=1TOT*60:NEXT:GOTO805
```

Continued on page 110

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Continued from page 108

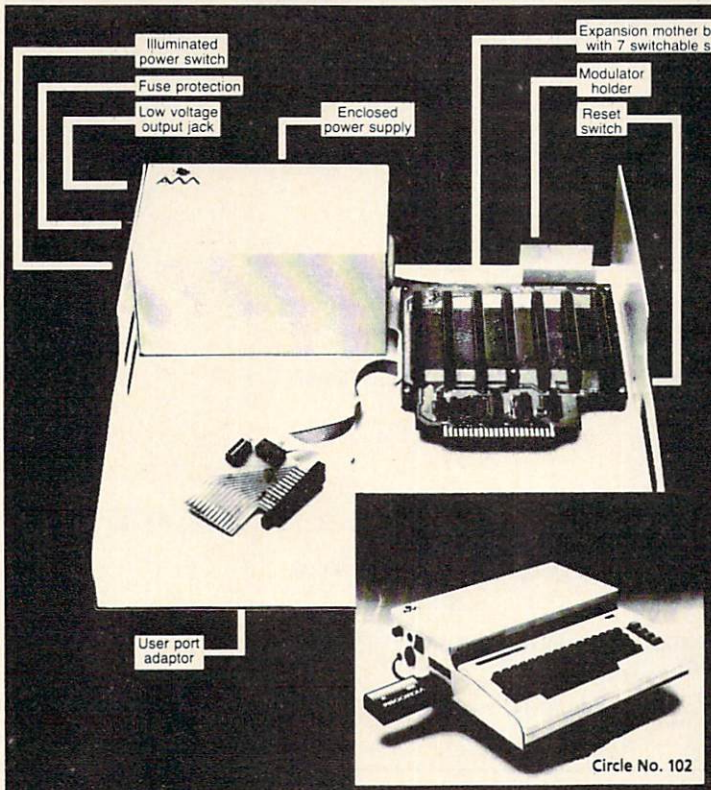
```
820 DATA201,2,195,2,201,2,195,2,201,2,195,4,183,2,191,2,183,2,191,2,183,2,191,2,
183,6
822 DATA207,2,195,2,175,2,195,2,207,4,201,4,195,4,175,4,195,6,0,0,-1,0
1000 REM USE AGAIN
1005 PRINT"■■DO YOU WANT TO USE     THIS PROGRAM AGAIN?    ■     (Y/N)
1010 GETA$:IFA$="N"THENCLR:PRINT"□":END
1012 IFA$="Y"THENRUN
1014 GOTO1010
```

LISTING 2

```
1 REM TIMES TABLES
2 REM 64 VERSION
3 POKE53281,1
4 PRINT"□■"SPC(211)"*TIMES  TABLES*"SPC(144)"BY ANDY VAN DUYNE"
5 GOSUB700:GOSUB700
7 PRINT"■■■TOUCH A KEY..."
8 GETA$:IFA$=""THEN8
10 X=RND(-TI)
20 DIM P%(100,2)
30 GOSUB750
40 FORN=54272TO54296:POKEN,0:NEXT:POKE54296,15
42 S1=54272:POKES1+5,0:POKES1+6,255
100 REM *SET PROBLEMS*
102 PRINT"□■■■■SETTING UP PROBLEMS..."
105 FORN=1TO10:FORZ=1TO10
110 R=INT(RND(1)*100)+1
112 IFP%(R,1)=0ANDP%(R,2)=0THENP%(R,1)=Z:P%(R,2)=N:GOTO120
115 GOTO110
120 NEXTZ,N
130 FORN=1TO100:P%(N,1)=P%(N,1)-1:P%(N,2)=P%(N,2)-1:NEXT
200 FORN=1TO100
210 GOSUB600
215 PR=PR+1:IFPR=TZANDN<100THENPR=0:GOSUB800
220 NEXT
240 PRINT"□■■■THAT'S 100 PROBLEMS...":GOSUB520
242 IFWR=0THENPRINT"■■YOU GOT THEM ALL RIGHT■!!!!!!!!!!!!!!!!!!!!!!":GOSUB520:GO
TO1000
245 PRINT"■YOU GOT"100-WR"CORRECT":PRINT"■LET'S REVIEW THOSE YOU MISSED..."
250 PRINT"■TOUCH ■RETURN■"
255 GETA$:IFA$<>CHR$(13)THEN255
300 REM*RETRY WRONG*
305 Z=WR:WR=0
307 POKE53280,14
310 FORN=1TOZ
320 GOSUB600
330 NEXT
340 PRINT"■■ALL DONE WITH THESE■"
350 IFWR=0THENPRINT"■YOU GOT THEM ALL THIS TIME!":GOSUB520:GOTO1000
360 GOSUB700:GOSUB700:PRINT"□YOU STILL NEED TO WORK ON THESE:■■"
370 FORN=1TOWR
375 PRINTP%(N,1)"X"P%(N,2)"=";
380 GOSUB700
385 PRINTP%(N,1)*P%(N,2)
389 GOSUB700
390 GOSUB700:NEXT
395 GOTO1000
500 REM*RIGHT ANS SOUND*
502 FORS=1TO3:FORZ=50TO105STEP15:POKES1,Z:POKES1+1,Z:POKES1+4,17
504 NEXTZ,S
506 POKES1+4,16:POKES1+1,0:POKES1,0:RETURN
520 REM *WHOLE SECT.*
522 FORS=1TO5:FORZ=150TO30STEP-4
524 POKES1,Z:POKES1+1,Z:POKES1+4,33
526 NEXTZ,S
528 POKES1+4,32:POKES1,0:POKES1+1,0
530 RETURN
600 REM SHOW PROBLEM
```

Continued on page 112

New VIC Superchassis II



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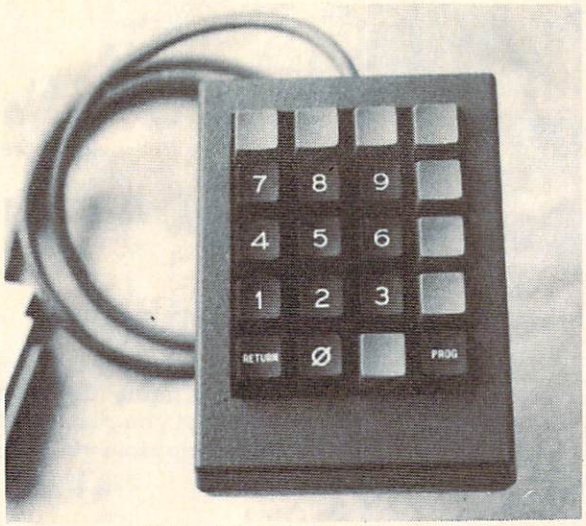

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Circle No. 84

Continued from page 110

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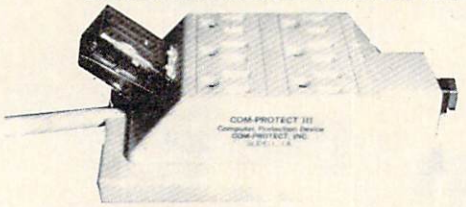

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Circle No. 103

PROFILE: Comm*Data

By Diana Sikes for Audio Visions

Have you ever wondered what a commercial software firm is really *like? Have you conjured up the image of a pressure-cooker environment with a bunch of "mad programmers" hacking away all day and night, taking breaks only to shoot rubber bands and paper airplanes at each other?*

Our occasional series profiling a variety of commercial computer firms should convince you that not all of them fit the stereotype. The following example, in fact, makes it clear that even a very successful company can retain a "family atmosphere.".

Comm*Data Computer Center is the largest dealership in Michigan.

COMM*DATA

Four years ago, in the kitchen of their home in Milford, Michigan, Larry Jones and his wife Mary started Comm*Data Computer House. Today, it is one of the three largest independently owned software producers in America, with 3 facilities, 42 employees, and worldwide distribution. Given the state's recent depressed economic climate, Comm*Data's success is quite an accomplishment. Business is growing at an estimated 500% annually.

Larry traced the company's evolution. "I bought one of the first microcomputers, and decided it was a good field to get into. So I got a franchise for a Commodore dealership (Comm*Data Computer Center), and started selling them out of my home. Almost immediately, I discovered you couldn't sell those things without software. At the time, 80% of our customers were educators and school systems. We found the better our educational software, the more computers we'd sell. They went hand in hand." Soon, the market for Comm*Data software expanded to include other computer retailers who were finding themselves in a similar bind.

In 1981, with the advent of such personal computer systems as the Commodore VIC-20, it became apparent that the computer's role as an instructional device wasn't limited to the classroom. Jones explains an advantage of educational software designed for home use. "The computer has infinite patience. Even the most perfect parent can't match it as a tutor. If Johnny blows it again and again, the computer won't fly into a rage. It takes the pressure off the child, as well as the parent." I have kids, so I know. They use the computer in our home.

From his experience with the school systems, Larry realized there is more to designing educational software than simply programming the information. Home tutor programs must incorporate the principles of positive reinforcement. "We have to be careful that the biggest and best things happen when the correct answer is given. In the early stages, we had

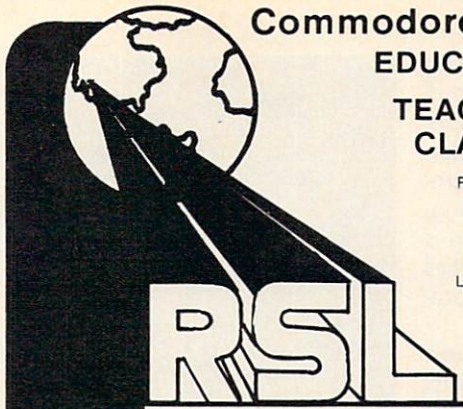
a program in which a wrong answer would elicit great graphic explosions on the screen. In effect, we were rewarding the kids for the wrong response." A team of professional educators reviews each program for both qualitative content and effective presentation. Jones continued, "The computer has to do more than just differentiate between right and wrong answers. With each wrong answer, it must go back through the problem, and, using words and pictures, explain what went wrong and how to fix it. We are producing educational games like Gotcha Math and English Invaders that really make learning fun."

Comm*Data was well on its way to becoming a software market leader when the Jones' began to shift their attention from strictly educational programs. The company's reputation for integrity in the educational arena gave them a natural edge in the computer video game market. Although they could not ignore the tremendous appeal of games in the marketplace, they were careful to apply the techniques they'd acquired while working with the schools.

"We learn from playing games. Our programs don't reward the violent capture or the 'kill' at the end of the chase. We concentrate on the chase itself, encourage players to strive for improvement and help them learn to deal with success and failure while they improve their hand/eye motor coordination."

In addition to producing games and educational software, Comm*Data is expanding into the utility and home business market to satisfy the growing needs of the Commodore user. This year, they introduced the Multi-level Marketing Manager (MLM), an extensive and easy to use system to maintain profit control for the independent business person. This area is perhaps the major rapid-growth segment of the software industry today.

The responsibility for program development lies mainly with the company's staff and educational consultants. Once an idea is agreed upon, it is "storybooked" and represented pictorially. An educator or staff member draws a representation of the computer screen at various program stages. A storybook may be anywhere from two to thirty pages or more. The completed storybook is then reviewed by a head programmer to determine its program feasibility. Jones notes with pride that the "program-ability" is growing. "We are doing things now which would have been considered impossible two years ago." They now use a high-resolution



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graphics computer, vastly expanding graphics capabilities, and are involved in their own research and development projects. Once a storybook concept is determined to be workable, it goes to a programming team for the detailed writing. The leader of the programming team is responsible for coordinating the activities of the various audio and visual programmers.

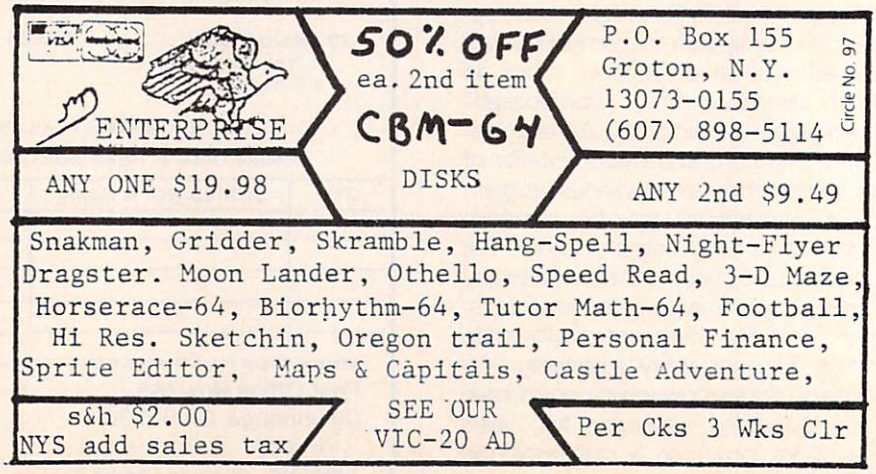
Comm*Data takes a consumer-driven approach to marketing their products. Suggestions from stores and customers figure prominently in the development of new product concepts. No matter how good the concept, though, Comm*Data realizes it will not sell if it is not packaged correctly. The firm was an originator of the "library-box" package. Stronger and more functional than its ziploc and blister card predecessors, the heavy duty vinyl library-box allows for easy storage of software. Comm*Data's concern for packaging led them to form a subsidiary, P&L Packaging, in Denver, Colorado.

Although software production takes up most of the Jones' attention, they haven't lost sight of the retail computer business that started it all. Their Comm*Data Computer Center is the largest dealership in Michigan, and is currently seeking state certification to begin a vocational training program.

Above all else, Jones attributes Comm*Data's success to the healthy working environment he and Mary have managed to establish in the company. "Comm*Data is a cooperation of people. We all work together to get the job done." Every Wednesday morning, the entire company staff gets together for breakfast and 'bull', in an atmosphere which encourages everyone to air feelings on a variety of topics from the latest program concept to company policy. This spirit of camaraderie extends beyond the workplace. The staff's computer-shaped entry placed 3rd in the 1983 Milford Raft Race down the nearby Huron River. As Larry said, "It may not have been very fast, but it took a great picture!" Although the company has attained worldwide stature, it still hasn't lost touch with its small town roots.

Mr. Larry Jones, President of Comm*-Data, attributes his success to "a cooperation of people . . . we all work together to get the job done."

Comm*Data Computer House launched four years ago in Milford, Michigan. Now employs 42 people out of a town of 9,000.



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Circle No. 185

An Introduction To Assembly Language

INTERRUPTS Part XII

By Eric Giguere

We're really advancing here! This month we look at the hardware interrupt, or IRQ. The things that can be achieved with a little creativity will astound you. Also, please make sure to read the last section of the article as I have an important notice to give you.

INTERRUPTS

Every 60th of a second the 6502 (or 6510) chip in the VIC or C-64 is literally interrupted by the IRQ. 'IRQ' stands for Interrupt ReQuest and is a signal telling the chip to drop whatever it is doing at the moment and jump to a location in memory to take care of something else. Usually the chip uses the IRQ to update the clock, check the STOP key and check the keyboard for keypresses. Notice I said 'usually'. Yes, it is very possible (and very easy) for us to change what the chip does during the IRQ. But first let's take a closer look at what happens during an IRQ.

When the chip receives the interrupt signal, it doesn't literally drop everything just to handle (carry out) the IRQ. First it finishes executing the current instruction, saves the current memory address (program counter) and the status pointer onto the stack, and then jumps off to the IRQ routine. When this routine is finished it executes and RTI or 'ReTurn from Interrupt', which causes the chip to re-load the status register and program counter from the stack, continuing where it left off, just as if nothing happened. And to think, this happens 60 times a second but to the chip it happens only once every few thousand instructions. Now that is fast!

CHANGING THE IRQ

The nice thing about the IRQ is that it uses two memory locations in RAM to tell it where to go. These locations form an indirect pointer or 'vector', with the address in standard low-byte, high-byte format. Normally this vector (located at $Ø314-$Ø315 on both the VIC and C-64) points to $EABF for the VIC and $EA31 for the C-64. These addresses are the starting locations of the interrupt handling routines for both machines. The routines themselves cannot be changed because they are in ROM. But the IRQ vector happens to be in RAM, meaning that we can change it by storing new values in the bytes. If we do that, we can send the interrupt wherever we want in memory, usually at our own special program. This can be used to achieve some pretty neat tricks.

Using what we've learned so far, we could probably code the routine to change the IRQ vector as such:

```
LDA #IRQLO
STA #Ø314
LDA #IRQHI
STA $Ø315
```

where IRQLO and IRQHI are the low and high bytes of the new IRQ routine's address. There is only one problem with this method. What happens if, say, an interrupt occurs when only half of the new address has been stored? The chip will be sent to some mixed-up address, probably somewhere in Never-Never Land. Consider yourself lucky if you don't have to shut off the computer because it froze up on you. Here we need something to temporarily shut out interrupts. Fortunately for us, 65Ø2/651Ø assembly language gives us such a capability via the status register.

SEI/CLI

In the status register there is one special bit that enables and disables the hardware (IRQ) interrupt. When set (1) it disables the IRQ and when clear (Ø) it allows them through. Two special instructions allow us to set and clear this handy bit:

```
SEI
and CLI
```

The first SEts the Interrupt bit and the second Clears the Interrupt bit, effectively disabling and enabling the IRQ.

Placing SEI before our previous routine and CLI after it will make sure no interrupt will arise while changing the vector (just remember that SEI disables and CLI enables). In fact, a general assembler routine for changing the IRQ looks like this:

```
CHANGE SEI
       LDA #(NEWIRQ
       STA $Ø314
       LDA #)NEWIRQ
       STA $Ø315
       CLI
       RTS

NEWIRQ . . .
       . . .
```

This routine would be called from either BASIC via the SYS command or as a subroutine in a larger assembly language program. It changes the IRQ vector to point to NEWIRQ, which will then be-

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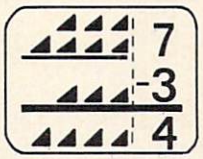

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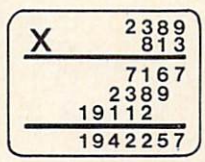

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come the new IRQ handling routine. One thing that should always be done at the end of your own IRQ routine is to do a

JMP $EABF (VIC)
or JMP $EA31 (C-64)

This will make sure the interrupt handles the usual housekeeping chores it's supposed to. Otherwise you should always end your routine with an RTI. An example IRQ routine is shown in listing 1. To try it out type in the BASIC program in either listing 2a (VIC) or 2b (C-64). Explanation s as to what it does are given in listing 1.

USES FOR IRQ

The uses for the IRQ vector are pretty well limited to your imagination. Because they happen every 60th of a second they are useful for running 'user transparent' routines, routines that run without notice. Games use it for such things as scrolling the screen or playing music without interruption. Or it could be used in a utility program, such as Program 1.

A QUESTION FOR MY READERS

I'm nearing the end of my series on assembly language and I would like your opinions as to whether I should continue it or start a new column on some other aspect of computing (or both?). If I continued with the column I could call it "Explorations into Assembly Language" and examine more advanced aspects of assembly language, preferably from suggestions sent in by readers. Please send your comments about this to *COMMANDER*. A simple post card will do. Thanks.

LISTING 1

```
FILE NAME: IRQ EX.OBJ

LINE LOC.   CODE      LABEL   OP. OPERAND        COMMENTS
---- ----   ----      -----   --- -------        --------

0001 033C              ; 'PAUSE LOOP' BY RAETO WEST
0002 033C              ; AS FOUND IN 'PROGRAMMING THE PET/CBM'
0003 033C              ; MODIFIED FOR USE ON THE VIC & C64
0004 033C              ;
0005 033C                      ORG $033C       ;CASSETTE BUFFER
0006 033C              ;
0007 033C              GETCHR EQU $FFE4
0008 033C              IRQVEC EQU $0314
0009 033C              ;
0010 033C 78           CHANGE SEI             ;BLOCK OUT IRQ
0011 033D A9 49                LDA #<NEWIRQ    ;GET LOW-BYTE
0012 033F 8D 14 03             STA IRQVEC      ;& REPLACE
0013 0342 A9 03                LDA #>NEWIRQ    ;DO SAME FOR HIGH-BYTE
0014 0344 8D 15 03             STA IRQVEC+1
0015 0347 58                   CLI             ;RE-ENABLE IRQ
0016 0348 60                   RTS             ;RETURN TO BASIC
0017 0349              ;
0018 0349 20 E4 FF     NEWIRQ  JSR GETCHR      ;GET KEYPRESS
0019 034C C9 40                CMP #'@         ;CHECK FOR '@' PRESS
0020 034E D0 07                BNE EXIT        ;NOT '@' LEAVE ROUTINE
0021 0350 20 E4 FF     WAIT    JSR GETCHR      ;WAIT UNTIL '@'
0022 0353 C9 40                CMP #'@         ;IS PRESSED AGAIN
0023 0355 D0 F9                BNE WAIT
0024 0357 4C 31 EA     EXIT    JMP $EA31       ;JUMP TO NORMAL IRQ ROUTINE
0025 035A              ; (JMP $EABF FOR VIC)
0026 035A              ;

ASSEMBLY COMPLETE.


SYMBOL TABLE:

GETCHR-$FFE4    IRQVEC-$0314    CHANGE-$033C    NEWIRQ-$0349    WAIT---$0350
EXIT---$0357
```

Continued on page 122

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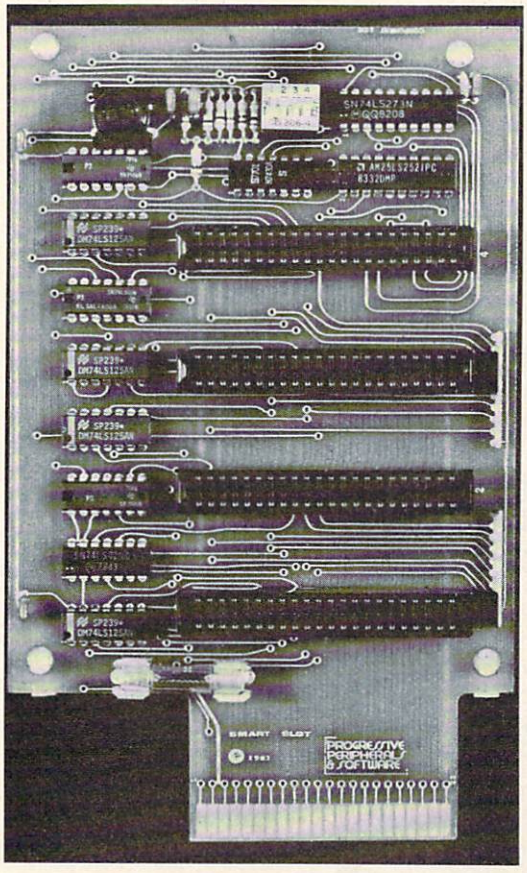

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Continued from page 120

LISTING 2A

```
10 REM 'PAUSE LOOP' BY RAETO WEST
11 REM MODIFIED VERSION FOR THE VIC
12 REM BY ERIC GIGUERE  SEPT.26/83
15 :
20 POKE 36879,27
25 FOR I=828 TO 857: READ J: POKE I,J: NEXT: SYS 828
30 PRINT CHR$(142); "■PAUSE PROGRAM HAS BEEN LOADED &"
35 PRINT "ACTIVATED.  TO USE, SIMPLY HIT THE '@'"
40 PRINT "KEY WHEN YOU WISH TO PAUSE A PROGRAM OR"
45 PRINT "A LISTING.  WHEN READY HIT THE '@' KEY"
50 PRINT "ONCE MORE TO CONTINUE WHERE YOU LEFT OFF"
55 PRINT "TO DEACTIVATE PAUSE HIT RUN/STOP &"
60 PRINT "RESTORE.  TO RE-ACTIVATE TYPE 'SYS 828'."
65 PRINT "WARNING: DEACTIVATE BEFORE USING TAPE"
70 PRINT "IN ANY WAY."
75 END
99 :
100 DATA 120, 169, 73, 141, 20, 3, 169, 3, 141, 21, 3, 88, 96, 32
110 DATA 228, 255, 201, 64, 208, 7, 32, 228, 255, 201, 64, 208, 249, 76
120 DATA 191, 234

READY.
```

LISTING 2B

```
10 REM 'PAUSE LOOP' BY RAETO WEST
11 REM MODIFIED VERSION FOR THE C64
12 REM BY ERIC GIGUERE  SEPT.26/83
15 :
20 POKE 53281,1
25 FOR I=828 TO 857: READ J: POKE I,J: NEXT: SYS 828
30 PRINT CHR$(142); "■PAUSE PROGRAM HAS BEEN LOADED &"
35 PRINT "ACTIVATED.  TO USE, SIMPLY HIT THE '@'"
40 PRINT "KEY WHEN YOU WISH TO PAUSE A PROGRAM OR"
45 PRINT "A LISTING.  WHEN READY HIT THE '@' KEY"
50 PRINT "ONCE MORE TO CONTINUE WHERE YOU LEFT OFF"
55 PRINT "TO DEACTIVATE PAUSE HIT RUN/STOP &"
60 PRINT "RESTORE.  TO RE-ACTIVATE TYPE 'SYS 828'."
65 PRINT "WARNING: DEACTIVATE BEFORE USING TAPE"
70 PRINT "IN ANY WAY."
75 END
99 :
100 DATA 120, 169, 73, 141, 20, 3, 169, 3, 141, 21, 3, 88, 96, 32
110 DATA 228, 255, 201, 64, 208, 7, 32, 228, 255, 201, 64, 208, 249, 76
120 DATA 49, 234

READY.
```

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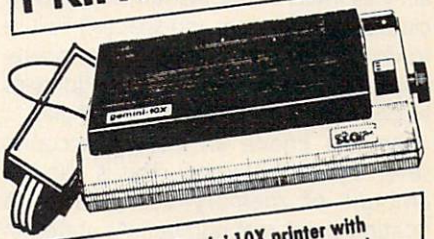

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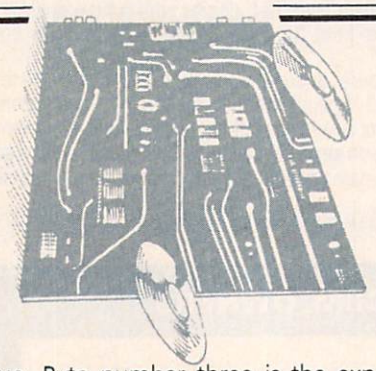
Data Organization For The VIC-20: Part II

By Arthur J. Dudley



Last month's article dealt with the storage of integers in memory. This month, I am going to cover floating point real numbers. The method of storing floating point reals may be difficult to understand at first; therefore, take your time and read each paragraph carefully. Before you start, LOAD and RUN the memory dump program provided in last month's issue and use it as a reference while reading. It is *important* that the memory dump program be inputted exactly as listed in the first article. (This includes line numbers and spaces.) Failure to do so may not affect program operation but will cause your memory addresses to differ from those given in examples.

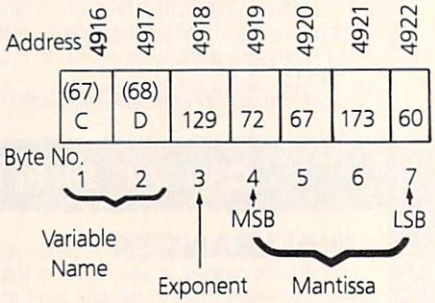
As you know, an integer occupies seven bytes of memory. This is also the amount of memory occupied by a floating point real number. As stated in last month's article, the VIC only uses four of the seven bytes for integers (two for the variable name, one for the MSB, and one for the LSB); however, floating point reals need all seven bytes.

The seven bytes that represent a floating point real are shown in figure 1. (Use the SPACE BAR to advance to address number 4916 on your screen display.) The first two bytes are reserved for the variable name, just as they are for integers. The only difference is floating point reals use straight ASCII code to represent variable names, while integers have the number 128 added to each decimal representation. The remaining five bytes are used to store the actual value. Byte number three is the exponent, and byte numbers four through seven are the mantissa.

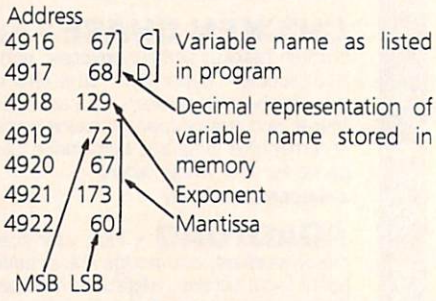
The least significant byte (LSB) of the mantissa is byte seven, and the most significant byte (MSB) is byte four. The difference between the LSB and the MSB is nothing more than their impact on the numbers they represent. For example, if you change the value of the LSB, the number it represents will change slightly; however, if you change the value of the MSB by the same amount, it will cause the number to change by a much larger factor. This will be more apparent later.

Byte number seven is the exponent, and is formed according to a technique called "excess 128" or "offset 128" notation, which means the number 128 is added to the true value of the exponent. For example, if the number 3 is the true exponent, VIC will add 128 to this true exponent (128 + 3 = 131). Thus the number 131 will represent a true exponent of 3 in memory. This technique allows the VIC to have negative exponents (i.e. If byte number three contains the number 120, the true exponent is 120 - 128 or a -8).

Figure 1: CD = 1.564565329



The floating point real variable "CD" as shown on the screen display:



Note: The following explanation will be based on the information shown in figures 1 and 2.

To convert the decimal representation seen in memory over to their true value, follow the five steps below. I will be using CD = 1.564565329 in the following examples.

STEP 1: Convert the mantissa into its binary configuration. See figure 2.

STEP 2: Number each bit from one to thirty-two starting form the leftmost bit of the MSB.

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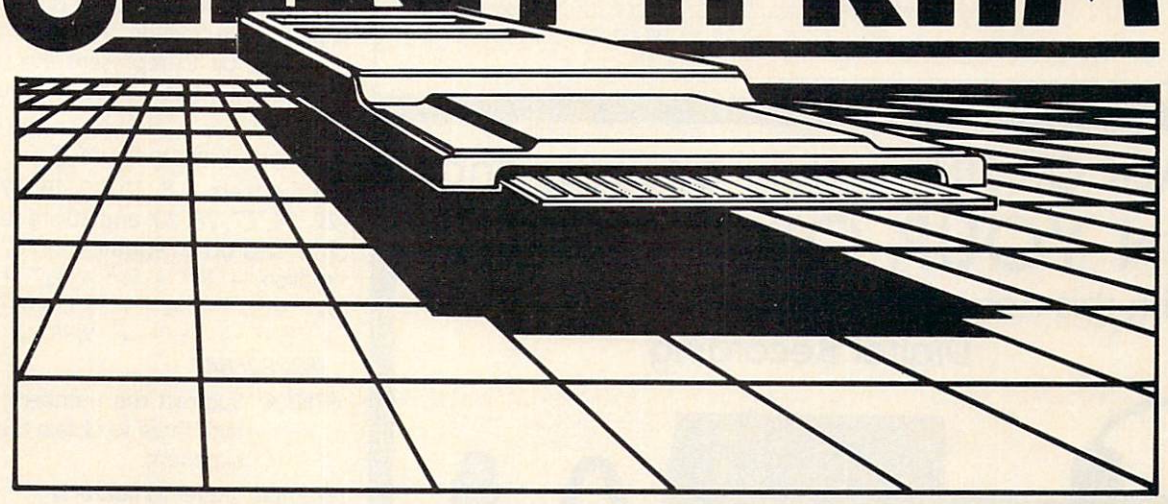

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Figure 2

Byte No.	Address	Binary Configuration	Decimal Equivalent
4	4919	0 1 0 0 1 0 0 0	72 (MSB)
	Bit #	1 (2) 3 4 (5) 6 7 8	
5	4920	0 1 0 0 0 0 1 1	67
	Bit #	9 (10) 11 12 13 14 (15) (16)	
6	4921	1 0 1 0 1 1 0 1	173
	Bit #	(17) 18 (19) 20 (21) (22) 23 (24)	
7	4922	0 0 1 1 1 1 0 0	60 (LSB)
	Bit #	25 26 (27) (28) (29) (30) 31 32	

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STEP 3: If a bit is set to one, then its number will be an exponent of ½. To determine the number represented by the mantissa, add these values of ½ raised to their proper exponent. The number the mantissa represents will range from .5 to but not including 1. The lowest value the first bit can represent is ½ ($½^1 = ½$). Since the lowest fraction cannot be less than ½, the VIC assumes that ½ is the first bit-value in the fraction. This then frees the left-most bit to represent the sign of a number (1 for negative, and 0 for positive).

Example: (Refer to figure 2)

Bit numbers 2, 5, 10, 15, 16, 17, 19, 21, 22, 24, 27, 28, 29, and 30 are set to one. This sets up an equation of $½^1$ (always implied) + $½^2$ + $½^5$ + $½^{10}$ + $½^{15}$ + $½^{16}$ + $½^{17}$ + $½^{19}$ + $½^{21}$ + $½^{22}$ + $½^{24}$ + $½^{27}$ + $½^{28}$ + $½^{29}$ + $½^{30}$ = *.782282664*

STEP 4: Subtract the number 128 from byte three to obtain the true exponent.

Example: (Refer to figure 1)

129 - 128 = 1 (true exponent)

The true exponent will have a base of 2.

STEP: 5: Multiply the fraction obtained in step three by the number 2 raised to the true exponent obtained in step 4.

Example:

$.782282664 \times 2^1 = 1.56456533$

(Determined in step 4; Determined in step 3)

The values shown in bytes three through seven represent the value of *1.56456533*. If you list line 6 of the memory dump program you will see the variable assignment for the above example. You may have noticed that in line 6, Variable CD equals 1.564565329, but the value stored in memory is 1.56456533. Because floating point reals can have only nine places, the VIC will round off any number exceeding this limitation prior to storing it in memory.

When you understand the above conversion process, try the below problem (Hint: The answer will be a negative number).

Byte #1	65	Variable Name
Byte #2	63	
Byte #3	135	Exponent
Byte #4	200	MSB
Byte #5	63	Mantissa
Byte#6	46	
Byte #7	73	LSB

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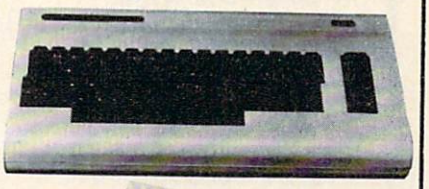

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What is the Variable name? _____
What is the Value?_____
To simplify the calculations of step three, utilize the conversion program on the following page. I will provide the answers in next months issue; however, you can still check your answer by replacing the value of variable "CD" with your result.

That concludes the section on floating point real numbers. Next issue, I will cover string variables and provide some input regarding practical uses for the memory dump program. If you have any questions or comments, please send your correspondence to the address below.
Arthur J. Dudley, *COMMANDER MAGAZINE*, P.O. Box 98827
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MANTISSA CONVERSION PROGRAM

```
5 SU=Ø
10 PRINT"INPUT AMOUNT OF BITS SET TO 1"
   :PRINT"IGNORE THE 1ST BIT"
20 INPUT BA:DIMB1(BA)
25 PRINT"INPUT BIT NUMBERS SET TO 1"
30 FOR J=1 TO BA
40   INPUT B1(J)
50 NEXTJ:PRINT"CALCULATING"
60 FOR J=1 TO BA
70   TS=.5
80     FOR JJ=2 TO B1(J)
90     TS=TS*.5
100    NEXTJJ:SU=SU+TS
110 NEXTJ
115 PRINT "MANTISSA EQUALS ";SU+.5
120 END
```

INSTRUCTIONS:
1. Enter the *amount* of bits set to one in your mantissa (do *not* include the first bit).
2. Enter *all bit numbers* that are set to one (do *not* include the first bit).
3. The output will equal the value represented by the mantissa. (will always be a fraction from .5 to but not including 1).

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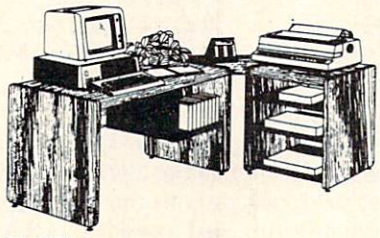

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When the C-64 was first introduced, a highly-advertised potential feature was "CP/M capability" through a plug-in cartridge containing a Z80 microprocessor. As usual, it took Commodore some time to bring this expansion package to the market. Following is a review of this new product by one of our knowledgeable consultants.

Z-80 CP/M for C-64

by George Gaukel

FORMAT: Disk
PRICE: $60.00
LANGUAGE: 8080/Z80 Operating System
MODEL: C-64
AUDIENCE: C-64 owners who wish to add CP/M capability.
SUMMARY: An excellent 8080/Z80 tutorial system.
SOURCE: Commodore Business Machines, INC. 1200 Wilson Drive West Chester, PA. 19380
RATING: Excellent
PERFORMANCE: Slow and reliable
DOCUMENTATION: Fair
WARRANTY: 90 days

The CP/M operating system purchased had one master disk, a 237 page USER'S GUIDE and a Z80 cartridge.

THE USER'S GUIDE

The guide has some serious omissions, which makes using the CP/M assembler difficult. The section describing the assembler does not give a listing of acceptable opcodes and pseudo operators (assembler directives). Also, there is not a listing of the mathematical operators and their precedence. I will attempt to identify these at the end of this review. The omission of this technical data makes it difficult to key in programs from source listings or modify down-loaded assembler files.

Pages 173 to 184 of the manual were deleted. Evidently this code was still under revision at press time.

The manual makes reference to a second disk, which was not included in my package.

The manual also refers to a IEEE-488 interface which was not yet available (hopefully by Christmas).

THE Z80 CARTRIDGE

There is nothing complicated here. Just plug in the cartridge with the power off and you are ready to boot CP/M. The I/O slot at $DE00 is used for co-processor control. The I/O slot at $DF00 is free for user use.

The MSD CIE C64-IEEE interface is not compatible with the Z80 cartridge. The Richvale C-64-LINK, according to an East Coast distributer, is also not compatible.

THE CP/M DISK

This disk contains the CP/M operating system and some utility programs. As only one disk is supplied, the first thing to do is make several backup copies as outlined in the guide. The following items are on the disk:

TRANSIENT COMMAND FILES

MOVCPM	Recreate the CP/M System
PIP	Copy specified file(s)
SUBMIT	READ file and execute commands
XSUB	Enter data in a SUBMIT file
ED	Line oriented editor
ASM	8080 Assembler
DDT	Debugger
LOAD	Generate a command file from a hex file
STAT	Provide file and disk status
SYSGEN	Create new system disk parameters
DUMP	Print the contents of a file in HEX
COPY	Format, backup or copy CP/M system tracks
CONFIG	Change I/O assignments, function keys or key codes

OTHER FILES

DUMP.ASM Assembler text file for the DUMP command

CP/M COMMANDS

SAVE	Save memory starting at $0100
ERA	Erase file(s)
DIR	List disk directory
REN	Rename a disk file
TYPE	Type the contents of a file
USER	Set user number

The disk is in DOS 2A format, which means disks from other CP/M systems will not work directly with the Commodore system. Users will need to purchase specially prepared disks with the CP/M languages or utilities on them or write/purchase their own down-loading utilities. The most common method for down-loading CP/M utilities is the use of an RS-232 interface. However, the RS-232 was not implemented in my version of CP/M for I/O use. This means users will have to purchase an RS-232 utility package or write their own driver routines using the 6510 co-processor and KERNAL routines. As an alternative, users could use standard DOS 2A files for down-loading and then write a CP/M utility to transfer the standard DOS file to a CP/M file. I expect both methods will be implemented and eventually available for purchase.

It should be noted that there are no high level languages supplied with the CP/M

system. These languages and associated applications must be purchased separately in a compatible disk format or downloaded. Some of these programs and languages may also require modification for 40-column screen compatibility.

GENERAL COMMENTS

The assembler provided is an 8080 assembler. This means the full power of the Z80 instruction set is not available unless a Z80 assembler is purchased. This was probably done to keep the overall cost down. The package as a whole is an excellent value.

Because the serial disks are slow, I do not forecast much success for business applications, unless the IEEE-488 disks are used. For those wishing to use the system in the home, this package opens the door to a wide range of applications without the investment in another computer system. For individuals wishing to learn the CP/M system and 8080/Z80 programming, this is a very cost-effective way of getting started. Schools and programming instructors should like this package. It makes available, on a single machine, two of the most widely distributed microcomputer operating systems.

Appendix B of the guide is a bibliography for CP/M and Z80 references. I have found that Alan R. Miller's 8080/Z80 ASSEMBLY LANGUAGE: TECHNIQUES FOR IMPROVED PROGRAMMING (JOHN WILEY $10.95) a good starting reference. This book gives extensive cross-reference between the two instruction sets. I have coded a large portion of the system monitor he presents for instructional purposes, using the alternate code for CP/M systems. The only modifications I had to make were for 40 column screen formatting.

ASSEMBLER DIRECTIVES AND MATH OPERATORS

The following information is the best I have to date for filling in the technical data gap in the USER'S GUIDE.

PSEUDO OPERATORS
ORG END EQU SET
IF ENDIF
DB DW DS

MATH OPERATORS AND PRECEDENCE
* / MOD SHL SHR
-+ NOT AND OR EOR

NOTE: Parenthesis can be used for expression delimiters.

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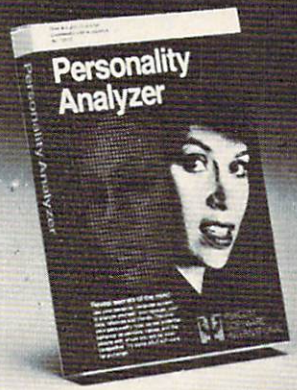

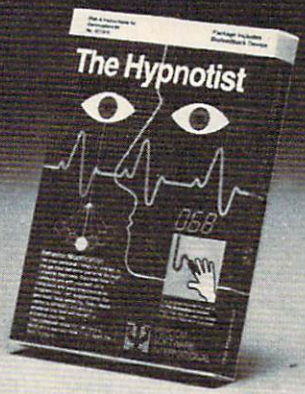

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Using a Machine Language Monitor

By Eric Giguere

USING A MACHINE-LANGUAGE MONITOR

This article requires the use of a machine-language monitor. If you do not have a monitor, then you may tape in the program alongside the article. Called BASICMON, it is a monitor written in BASIC for the VIC-20 and Commodore 64. If you plan to use it on an unexpanded VIC, then DO NOT type in any REM statements, line with colons (':') or any other comments (surrounded by asterisks). The program will then fit into a normal VIC with about 300 bytes left free.

WHAT IS A MONITOR?

First of all, we aren't talking about a **video monitor** you use in place of a TV. A **machine-language (ML) monitor** is a program (usually in machine language itself) that allows you to: 1) display and change bytes of memory, 2) enter and execute machine language programs, 3) load and save blocks of memory, 4) view the contents of the internal registers, and 5) exit to BASIC (i.e., reactivate the BASIC interpreter). More sophisticated monitor programs may include other capabilities but any monitor should contain at least these five features. A note should be added here: ML monitors are **not the same as assemblers.** An assembler is a program designed to translate assembly language programs into binary, machine language instructions. Although some monitors may contain single-line assembler/disassemblers, they are not **true**

```
10 REM ************
15 REM * BASICMON *
20 REM ************
25 REM
30 REM (C) 1983 BY
35 REM
40 REM ERIC GIGUERE
45 REM
50 MA=0:IFPEEK(806)=202THENMA
 FOR VIC, MA=1 FOR C64
52 :
55 IFMATHENPOKE53280,3:POKE53281,1:GOTO6
5
60 POKE36879,27: REM CHANGE COLOURS
62 :
65 LOMEM=PEEK(44)*256+PEEK(43)-2: HIMEM=
PEEK(46)*256+PEEK(45)+1
70 PRINT CHR$(142);"<CLR><BLK><DWN><DWN>
<RHT><RHT><RHT><RHT>** BASICMON **"
75 PRINT "<DWN><RHT>(C)1983 BY E.GIGUERE
<BLU>": GOTO 400
95 :
96 ****************
97 * MAIN ROUTINE *
98 ****************
99 :
100 PRINT"<BLK>.";:GOSUB1000
105 J=0: FOR I=1 TO 8: IF Z$=MID$("LMRGS
XDC",I,1) THEN J=I: I=9
110 NEXT:IF J<>0 THEN PRINT "<BLU>";: ON
 J GOTO 200,600,400,500,300,700,800,825
111 :
112 REM CHANGE MEMORY COMMAND (':')
113 :
115 IF ASC(Z$)<>58 OR LEN(IN$)<8 THEN 15
00
120 V$=MID$(IN$,2,4): GOSUB 2020: IF DV<
HIMEM AND DV>LOMEM THEN 1500
125 P=DV: FOR Z=7 TO LEN(IN$) STEP 3: V$
```

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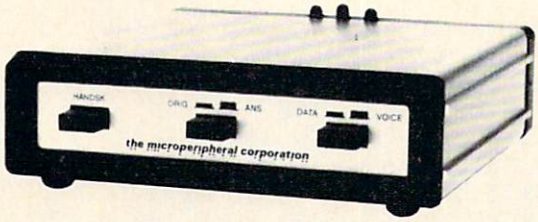

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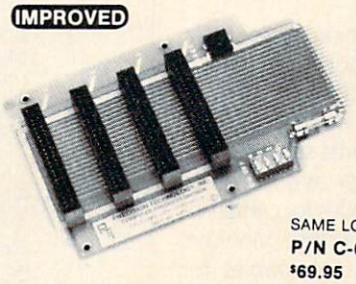

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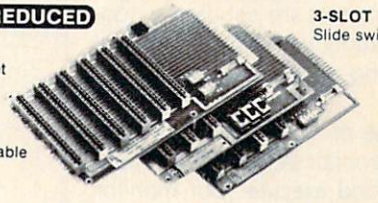

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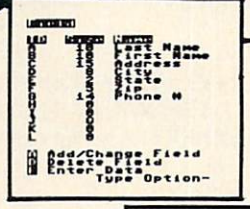

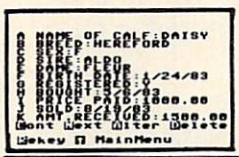

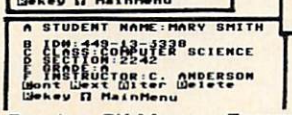

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assemblers because they are unable to handle lable names, pseudo-opcodes and comments. Be sure when purchasing a program that it is what you want: a monitor or an assembler.

So what are the main uses of a machine-language monitor? Basically, it is used to examine and change bytes of memory, and to enter or modify small ML programs. (Large programs should really be done on an assembler as it becomes tedious looking up the codes for certain instructions in reference books.) Monitors are also used to enter data tables for assembly language programs when it is too tedious to do so with the assembler. Sometimes monitors are just used to fool around in memory with no specific purpose, becoming an interesting learning tool.

The purpose of this article is to learn how to use a monitor. Before going on any further; load and execute your monitor program. Users of BASICMON can simply load and RUN it. PET/CBM owners can type SYS 1024 and hit RETURN.

MONITOR COMMANDS

Every monitor should have at least the following set of one-letter commands: G,L,M,R,S, and X. These stand for **G**oto program, **L**oad memory, **M**emory display/change, display **R**egisters, **S**ave memory and e**X**it to BASIC. Got your monitor loaded? Good. We're about to explore the first command: M.

MEMORY CHANGE/DISPLAY

One thing you'll notice about a monitor is that every line has a period at its beginning. This is to remind you that the monitor is active and you are not in BASIC. Type your one-letter command immediately after this period. Most monitors will ignore spaces between the period and the command but if you are using BASICMON, always make sure there are no spaces or the commands will not be interpreted properly. We are now ready to examine memory using the M command. Your cursor should be flashing just to the right of a period. If so, type the letter "M" and press RETURN.

What happened? A question mark probably appeared, right? This is because we didn't give it any parameters to work with–we didn't tell the monitor which part of memory we wanted to view. It responded with a question mark, meaning there is an error somewhere. The proper form for the M command is something like this (for you beginners out there, the last word on the line below is simply a reminder to press the RETURN key):

```
=MID$(IN$,Z,2): GOSUB 2020: POKE P, DV
130 P=P+1: NEXT: GOTO 100
195 :
196 ********************************
197 * LOAD MACHINE-LANGUAGE PROGRAM *
198 ********************************
199 :
200 IF LEN(IN$)<8 THEN 1500
205 X=0: FOR Z=3 TO LEN(IN$): IF MID$(IN
$,Z,1)=CHR$(34) THEN QU(X)=Z: X=X+1
210 NEXT: IF X>2 THEN 1500
215 IF QU(1)=QU(0)+1 THEN 1500
220 P=512: FOR Z=QU(0)+1 TO QU(1)-1: X=A
SC(MID$(IN$,Z,1)): POKE P,X: P=P+1
225 NEXT: POKE 183, P-512: POKE 187,0: P
OKE 188, 2: POKE 185, 1: POKE 184, 127
230 POKE P, 169: POKE P+1,0: POKE P+2, 3
2: POKE P+3, 213: POKE P+4, 255
235 POKE P+5, 96:V$=MID$(IN$,QU(1)+2): G
OSUB 2020: POKE 186, DV: POKE 157, 128
240 PRINT "<UP>";: SYS P: PRINT: GOTO 1
00
295 :
296 ********************************
297 * SAVE MACHINE-LANGUAGE PROGRAM *
298 ********************************
299 :
300 IF LEN(IN$)<18 THEN 1500
305 X=0: FOR Z=3 TO LEN(IN$): IF MID$(IN
$,Z,1)=CHR$(34) THEN QU(X)=Z: X=X+1
310 NEXT: IF X>2 THEN 1500
315 IF QU(1)=QU(0)+1 THEN 1500
320 P=512: FOR Z=QU(0)+1 TO QU(1)-1: X=A
SC(MID$(IN$,Z,1)): POKE P,X: P=P+1
325 NEXT: POKE 183, P-512: POKE 187,0: P
OKE 188, 2: POKE 185, 0: POKE 184, 127
330 V$=MID$(IN$,QU(1)+2,2): GOSUB 2020:
POKE 186, DV: POKE 157, 128
335 V$=MID$(IN$,QU(1)+5,4): GOSUB 2020:
DV%=DV/256: POKE 194, DV%
340 POKE 193, DV-DV%*256: POKE P, 169: P
OKE P+1, 193: POKE P+2, 162
345 POKE P+4, 160: POKE P+6, 32: POKE P+
7, 216: POKE P+8, 255: POKE P+9, 96
350 V$=MID$(IN$,QU(1)+10,4): GOSUB 2020:
 DV%=DV/256: POKE P+3, DV-DV%*256
355 POKE P+5, DV%: PRINT "<UP>";: SYS P
: PRINT: GOTO 100
395 :
396 ************************************
397 * 'R' COMMAND (DISPLAY REGISTERS) *
398 ************************************
399 :
400 PRINT "<DWN>  AC  XR  YR"
405 FOR Z=780 TO 782: DV=PEEK(Z): GOSUB
2000: PRINT "  ";HX$;: NEXT: PRINT "<DWN
>"
410 GOTO 100
495 :
496 ****************************
497 * 'G' COMMAND (GOTO PROGRAM) *
498 ****************************
499 :
500 IF LEN(IN$)<6 THEN 1500
505 V$=MID$(IN$,3,4): GOSUB 2020: SYS DV
```

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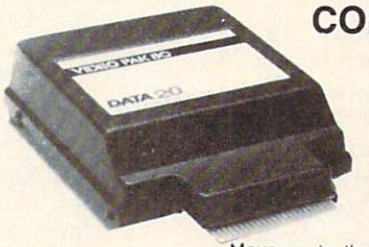

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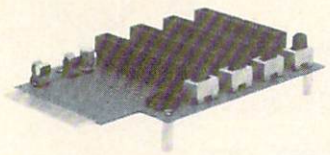

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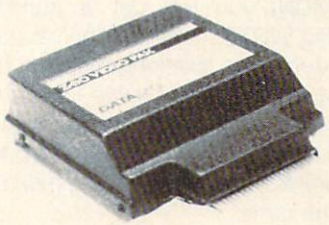

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.M 0000 00FF (RETURN)

This will display all the bytes of memory starting from location 0 to location 255. I forgot to mention that all numbers in a monitor are entered and displayed in **HEXADECIMAL,** or base 16. If you don't know what that means then read my column in the January 1983 issue of **Commander** or Tim Parker's article "Bits, Bytes and Binary" in the February issue. For now, though, the main thing to remember is that, in hexadecimal (often called **hex**) the letters A through F are used as single digits to represent the numbers 11 through 15. in the rest of this article, I'll follow the convention of indicating a hex number by starting it with a "$" (such as $B34F). However, the $ will not appear on your screen display.

Getting back to our example, your screen should have filled up with an array of hex numbers, all neatly arranged in rows. These are the contents of the memory locations from $00 to $FF (0 to 255), just as if you had PEEKed them.

Because there are too many numbers to fool around with we'll do another M command, this time displaying the contents of the first five bytes of the cassette buffer. Type:

.M 033C 0340 (RETURN)

The next line should look like this:

.:033C 00 00 00 00 00

The first number ($033C) is the memory location in hex. The second number is the value within that location, right now a zero. The third to sixth numbers are the value of the four locations following $033C. This means that the last zero on the line is the displayed contents of location $0340. A note to PET and C-64 owners: on your machines (unless using BASICMON) you will get 8 numbers following $033C. These are the values of the next memory locations, meaning that the last number is the value in location $0343. Because the VIC can display only five values on one line, I will be using five in my examples, but otherwise, the monitors work the same.

Notice that in typing our command, the first number indicated the starting location, and the second indicated the last location we wished to examine. What if we had typed:

.M 033C 0341 (RETURN)

Do it just to see. On the 30-column machines you shouldn't see any difference, but if you use the VIC you will see:

.:033C 00 00 00 00 00
.:0341 00 00 00 00 00

```
510 GOTO 100
595 :
596 ********************************
597 * 'M' COMMAND (DISPLAY MEMORY) *
598 ********************************
599 :
600 IF LEN(IN$)<8 THEN 1500
605 V$=MID$(IN$,3,4): GOSUB 2020: SM=DV:
 V$=MID$(IN$,8,4): GOSUB 2020: EM=DV
610 PRINT: FOR Z=SM TO EM STEP 5: DV=Z:
GOSUB 2000: PRINT ".:";HX$;
615 FOR Y=Z TO Z+4: DV=PEEK(Y): GOSUB 20
00: PRINT " ";HX$;: NEXT Y: PRINT
620 GET A$: IF A$=" " THEN Z=EM+1: PRINT
: GOTO 100
625 NEXT: PRINT: GOTO 100
695 :
696 **********************
697 * 'X' COMMAND (END) *
698 **********************
699 :
700 END
795 :
796 ******************
797 * DISK ROUTINES *
798 ******************
799 :
800 IF LEN(IN$)<3 THEN 1500
805 IF MID$(IN$,3,1)="E" THEN 815
810 OPEN 15,8,15: PRINT#15, MID$(IN$,3):
 CLOSE 15: GOTO 100
811 :
812 REM INPUT FROM ERROR CHANNEL
813 :
815 OPEN 15,8,15: INPUT#15, E,E$,T,S: CL
OSE 15
820 PRINT "<DWN><RED>";E;"<LFT>,";E$;","
;T;"<LFT>,";S: PRINT: GOTO 100
821 :
822 REM CATALOG ROUTINE
823 :
825 OPEN 15,8,15,"I": CLOSE 15: OPEN 1,8
,0,"$0": NU$=CHR$(0): PRINT
830 GET#1,A$,B$
835 GET#1,A$,B$
840 IF A$="" THEN 885
845 GET#1,A$,B$
850 PRINT ASC(A$+NU$)+ASC(B$+NU$)*256;
855 GET#1,A$
860 IF A$="" THEN PRINT: GOTO 835
865 PRINT A$;
870 GET A$: IF A$=" " THEN 885
875 WAIT 197, 64
880 GOTO 855
885 PRINT: CLOSE 1: GOTO 100
995 :
996 **************************
997 * GENERAL INPUT ROUTINE *
998 **************************
999 :
1000 IN$="":PRINT" <LFT>";
1002 P=PEEK(209)+PEEK(210)*256+POS(0):CH
=PEEK(P):RC=128:TT=0
1004 POKEP,CH+RC:TT=TT+1:IFTT>10THENTT=0
:RC=128-RC:GOTO1004
1005 GETX$:IFX$=""THEN1004
```

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Notice the difference? When displaying memory, you will always see a full line of bytes. Even if you typed

.M Ø33C Ø33D

you would still see five (or eight) bytes displayed. Each new line also has a new starting number to show where in memory you are at the moment. The third zero following $Ø341 shows the value in location $Ø343. It's easier than counting from the original number.

Now that we can display memory, how about changing it? On most monitors this is very simple: just move the cursor up and across to the byte or bytes you want to change, type in the new value, and press RETURN when finished with a line. The new values will automatically be changed for you. If you're not using BASICMON, try to change the byte at $Ø33C to read $FF.

The BASICMON monitor doesn't have the capability to move the cursor around and change things, mainly because this would be too complicated and long for BASIC. Instead, I opted for another way, which will also work on any other monitor. Type a colon (":"), the four-digit hex location you want to change, a space, and then the new value in two digits. You may also change the bytes followed by typing in the values for these, all separated by spaces. Example:

.:Ø33C Ø1 Ø2 Ø3 (RETURN)

This would place the bytes $Ø1, $Ø2 and $Ø3 in locations $Ø33C, $Ø33D, and $Ø33E, respectively (you don't need to have five numbers following the location number). To prove what I just said, display the memory from $Ø33C to $Ø33E. It should look like this:

.:Ø33C Ø1 Ø2 Ø3 ØØ ØØ

All very neat and simple. You now know how to display and change bytes in memory, so give yourself a pat on the back. Now we can explore another command. But first, type in the following:

.:033C A9 FF ØØ (RETURN)

What you just entered was a small machine language program that we'll use in later examples. In case you're wondering what it says, it decodes as

```
LDA #$FF
BRK
```

It will load the accumulator with $FF and exit (BReak) back to the monitor. If this makes no sense to you, then find a beginning book on 65Ø2 assembly language or read my series in earlier issues of **COMMANDER.** BASICMON users should make the following change:

.:Ø33E 6Ø (RETURN)

```
1007 X=LEN(IN$)
1008 IFX$=CHR$(2Ø)ANDX>ØTHENIN$=LEFT$(IN
$,X-1):POKEP,CH:PRINT"{LFT} {LFT}";:GOTO
1002
1010 IFX$=CHR$(13)ANDX>ØTHENPOKEP,CH:PRI
NT:2$=LEFT$(IN$,1):RETURN
1012 IFASC(X$)<32ORASC(X$)>9ØTHEN1004
1015 IN$=IN$+X$:POKEP,CH:PRINTX$;:IFX$=C
HR$(34)THENPOKE212,Ø
1020 PRINT" {LFT}";:GOTO1002
1497 :
1498 REM ERROR MESSAGE
1499 :
1500 PRINT "{ UP}{RHT}?": GOTO 100
1995 :
1996 ************************
1997 * CONVERSION ROUTINES *
1998 ************************
1999 :
2000 HX$="": M=4: IF DV<256 THEN M=2
2005 DV=DV/4096
2010 FOR I=1 TO 4: N%=DV: HX$=HX$+CHR$(4
8+N%-(N%>9)*7): DV=16*(DV-N%): NEXT
2015 HX$=RIGHT$(HX$,M): RETURN
2016 :
2017 REM HEX TO DEC.
2018 :
2020 DV=Ø:X=Ø:FOR I=1 TO LEN(V$): N%=ASC
(V$): N%=N%-48+(N%>64)*7: V$=MID$(V$,2)
2025 DV=DV*16+N%: NEXT: IF DV<Ø THEN 150
Ø
2030 RETURN
2999 :
3000 ***** END OF PROGRAM *****
3001 :
```

This will change the BRK at the end to an RTS, which is needed since we are working from BASIC. When using a monitor written in machine language, you must end your programs with a BRK, but from BASIC, you end them with an RTS.

REGISTER DISPLAY

The next command is the R, or register display command. It shows you the current status of the 65Ø2's internal registers: the accumulator (AC), X-register (XR) and Y-register (YR), with their current values displayed underneath the abbreviations. More sophisticated monitors will also show other things, such as the PC counter (Program counter), SP (Stack pointer) and IRQ (interrupt request address) but they aren't really important. Typing R in BASICMON will give you something like this:

```
AC XR YR
2F E8 78
```

Don't concern yourself if the numbers are different. As long as you get something then the command works properly. If you are using a monitor other than BASICMON you can probably cursor up to the display and change any of the numbers, just like in the M command. Be sure to know what you are doing first.

GOTO PROGRAM

The third command is G, for Goto Program. This executes a machine language

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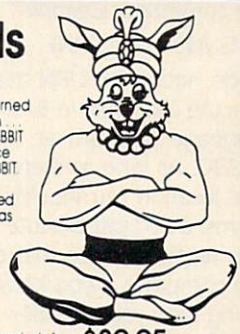

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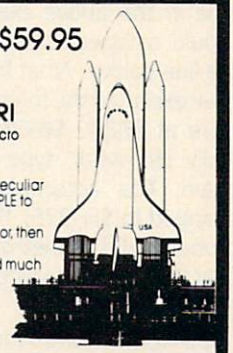

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program starting at the address following the command. Example:

.G Ø33C (RETURN)

Upon hitting RETURN the computer will execute (like RUN in BASIC) the machine language program at memory location $Ø33C. As long as there is a program at that location you shouldn't have any problems. Don't just execute from anywhere you want, because that could freeze up the computer. If you know what you are doing then you are safe.

Before going on to the next command type in the above example. The cursor should reappear almost immediately on the line below. What has happened? We have executed the three-byte program we store at $Ø33C-$Ø33E. To show that it really did work, type the R command again. The accumulator should have changed to $FF(225). If it didn't then you probably did something wrong. Check over the program using the M command and try again.

Our fourth command is used to save a block of memory to disk or tape. It has the format:

.S "PROGRAM",Ø,Ø33C,Ø33F

The 'Ø:' before PROGRAM specifies drive #Ø (in case you use a double disk drive) and the device number was changed to Ø8. This will save the block of memory from $Ø33C to $Ø33F onto device #1 (cassette) under the name PROGRAM. For disk (device #8) you would use the format

.S "Ø:PROGRAM", Ø8,Ø33C,Ø33F

When typing in these commands make sure your spacing is correct, with commas separating the numbers. Otherwise, there could be an error.

When specifying what parts of memory you want saved, you should always add one to the end address. That is, if you want to save up to $Ø97D you should enter the value Ø97E. This means that in our example above the memory from $Ø33C to $Ø33E will be saved, not the memory from $ØC to $Ø33C to $Ø33F. Save our little program to disk or tape using one of the commands above. Then type the following:

.:Ø33C ØØ ØØ FF (RETURN)

This will erase our program from memory. We are now ready to load it back in.

Our fifth command is used to load what we saved back into memory. It has the format

.L "PROGRAM",Ø1

What will load the program called PROGRAM from cassette. Disk users can type

.L "Ø:PROGRAM",Ø8

for the same reasons as before (drive Ø, device 8). Always make sure the device number is in two digits. To prove that it works, display the memory from $Ø33C to $Ø33E. Then load PROGRAM using one of the above. Now display the same bytes again. Voila! The original bytes should now be back. We have proved that both the S and L routines worked.

The last command, X, is a simple one. Simply type:

.X (RETURN)

and you will be returned to BASIC with the familiar 'READY' message. At this time it is usually helpful to type the CLR command to make sure all the pointers for BASIC are in good shape, as you might have changed them while in monitor.

ADDITIONAL COMMANDS

This is intended only for BASICMON users with disk drives. I've included two additional commands: C and D. C gives you a directory or Catalog of all the program on the disk. Simply type C and Press RETURN. Pressing a key will pause the listing until the key is released. Hitting the space bar will abort the command altogether. The D command is used to send commands to the disk drive and to read the error channel. Type D, a space, and then the command (without quotes). Example: to scratch a program, type:

.D S:PROGRAM (RETURN)

To read the error channel, you would type:

.D E (RETURN)

The current error status will be displayed.

CONCLUSION

You should now know the basics of using a monitor. It's always practical to know how to use this handy tool, even if you only use it once in awhile. If you have any problems or questions you can write me in care of *COMMANDER:*

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P.S. To all BASICMON Users: By using BASICMON you can examine the memory where the BASIC Program is held, but you cannot change it. I made sure of this so that you don't ruin the monitor program, as I have sometime done.

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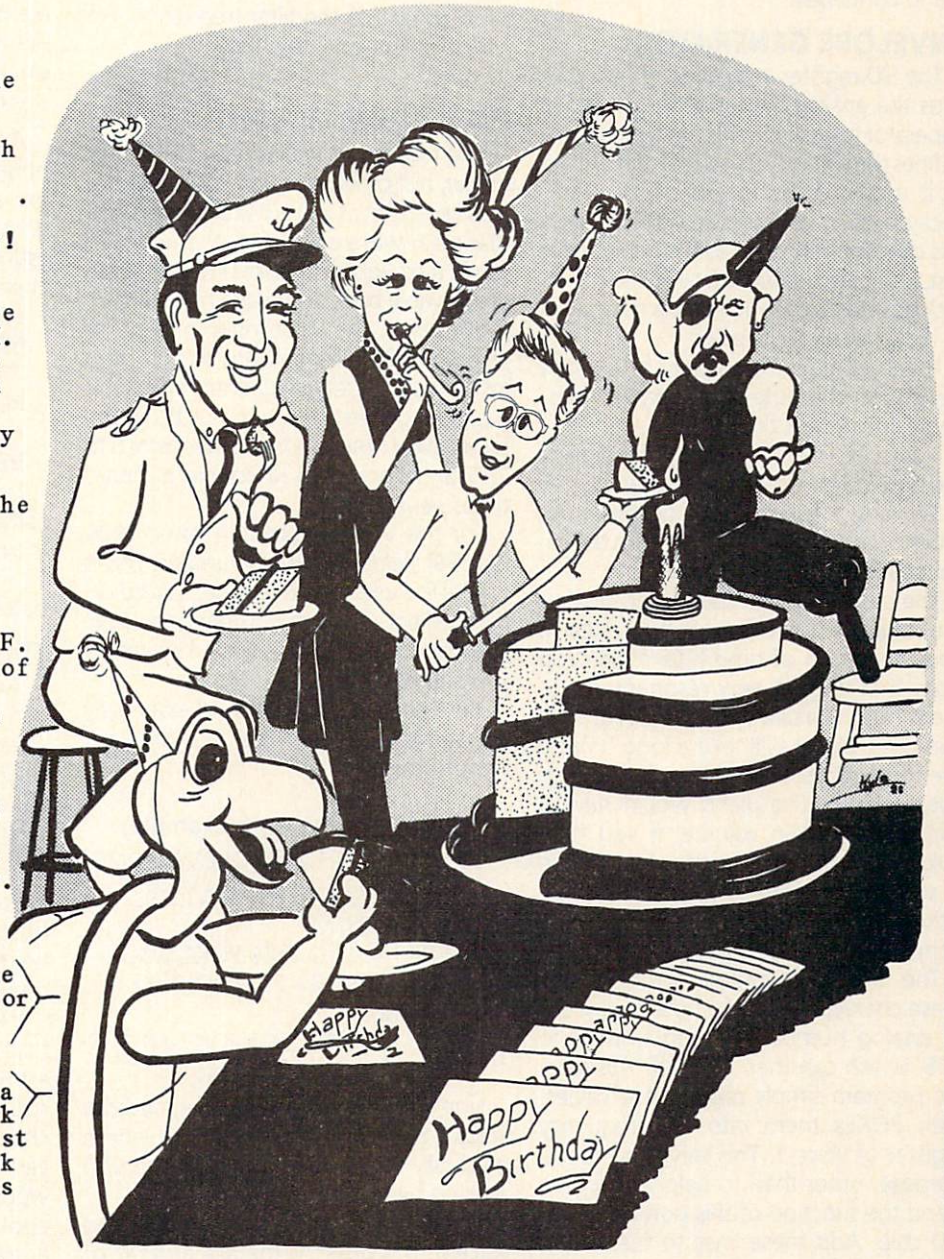

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Circle No. 42

Continued from page 80

was POKEd into the frequency register to vary the output. With the current example, however, the effect is achieved entirely within the SID chip, requiring no assistance from the central processor.

Prove this to yourself by replacing line 60 with:

```
60 STOP
```

Now when you run the program, even though execution stops, the beating sound continues.

ENVELOPE GENERATOR

The SID register at location 54300 contains the analog output of the envelope generator for voice 3. This function is what defines the volume of each individual note as it is played, by means of its attack, decay, sustain, and release (ADSR). While this concept may seem a little nebulous at first, let's consider some examples. The attack governs how much time a note takes to build initially to its peak:

–when a guitar is plucked or a piano key struck, the note is created very suddenly (low attack time).

–when a violin bow is gently drawn, the note builds slowly (high attack time).

Similarly, the decay value governs how much time is needed to drop from the initial peak to the sustain level.

The sustain and release levels govern the volume at which a note holds steady, and the length of time it takes to drop from that level. A very resonant instrument like the violin will have a high sustain level, plus it will take a long time to eventually drop from that volume (high release level). The piano would have a fairly high sustain volume; if you then hold the key down, the note will continue to sound a long time (high release time). If the key is not held, then the note will be immediately damped (low release time).

The envelope generator represents these characteristics of a note by a series of analog numbers varying from 0 to 255, which can then be read. This sample program simply reads those values, then POKEs them into the frequency register of voice 1. This serves no useful purpose, other than to help you understand the function of this portion of the SID chip. Add these lines to the framework program:

```
50 POKE W1+1,187:POKE W1+2,140:
   POKE W1,33
60 POKE W3,0:POKE W3,33
70 FOR I = 1 TO 150:POKE W1-3,
   PEEK(PE)/3+10:NEXT
80 POKE W1,32:POKE W3,32
90 FOR I = 1 TO 300:POKE W1-3,
   PEEK(PE)/3+10:NEXT
```

Line 50 gives voice 1 the same ADSR values as we gave voice 3 back in line 30.

Line 60 instructs the envelope generator for voice 3 to start its cycle.

Line 70 turns off bit 0 of both voices, which instructs the envelope generator to commence the release phase of its cycle.

Run the program: the rising and falling pitch you hear, remember, represents the analog value of voice 3's ADSR. A more useful application of this concept would be to apply it to the filter frequency. We will cover this one next time.

WAVEFORM OUTPUT

The register at location 54299 is very similar, but provides an analog output of the waveform of voice 3. For example, if a triangular wave is selected, the value will rise in a straight line from 0 to 255, then drop evenly back down again. For a sawtooth wave, the value rises in a similar fashion to 255, then jumps back to zero instantly. The frequency with which this happens governs the pitch of the note; for a typical note, the value rises from 0 to 255 and back to 0, a couple hundred times per second.

For the white noise generator, PEEK (54299) yields a random number. This is one of the uses of this feature, as a quick, if imperfect, random number generator. A second application is what I promised you earlier–sirens!!

Here are four examples, all essentially the same, but using the four different waveforms:

Triangular waveform example:

```
50 POKE W1+1,224:POKE W1+2,253
60 POKE W3-4,15:POKE W1,33
70 POKE W3,17
80 FOR I = 1 TO 1500:POKE W1-3,
   PEEK(PW)/10+25:NEXT:POKE
   W1,32
90 FOR I = 1 TO 1500:POKE W1-3,
   PEEK(PW)/10+25:NEXT
```

Line 50 sets very high ADSR times into voice 1, to simulate an emergency vehicle gradually approaching and (hopefully) passing by.

Line 60 sets a very low frequency into voice 3; this governs the rise and fall of our siren's pitch. The second command turns on voice 1.

Line 70 selects the triangular wave for the waveform generator.

Line 80 reads the wave generator, and POKEs its output into voice 1's frequency register. It then releases voice 1.

Line 90 continues reading the waveform as the siren fades away.

Sawtooth waveform example:

Simply changing the value 17 in line 70 to a 33 will give a 'sawtooth siren'.

Pulse wave example:

This is a little more complex, since we must set the pulse width as well. Add this:

```
70 POKE W3-1,8:POKE W3,65
```

This produces the 'bee-boop' siren that originated in Europe.

I will leave it to the adventurous experimenter to add the doppler effect to these sirens. Hint–it only requires two very small changes to line 90.

White noise example:

As I mentioned before, selecting white noise produces a randomly varying number at register 54299. As a result, this doesn't give a siren at all, but an interesting bubbling noise. Just make these changes:

```
50 :
60 POKE W3-3,15:POKE W1,17
70 POKE W3,129
80 FOR I = 1 to 300:POKE 54273,
   PEEK(54299)/7+3: NEXT
90 :
```

Line 60 sets up the frequency of voice 3 somewhat faster than before.

Line 70 selects white noise.

Line 80 does all the hard work, just like before.

TELSTAR

And yes, I know it's getting late, but I can't resist just one more example. Change the '17 in line 60 to a '19' (that selects synchronization). Change line 80 to read:

```
80 FOR I = 1 TO 300:POKE 54273,
   PEEK(54299):NEXT
```

Run the program, and if you can figure out what that sound represents, please let me know. We'll have a contest–best name wins a free pair of earmuffs.

Well, since you've stayed with me this far, I hope you've discovered some interesting new methods for getting the most out of SID, your 64's fascinating sound chip. I haven't tried to cover all possible variations of these techniques, for that would be impossible in even a substantial book. Perhaps these aren't the best examples of the potential sounds at your fingertips–that would depend on your own personal preferences. What I have tried to do is outline the possibilities and why they work. The rest of it is up to you!!!

Next time, we'll look at the filters, and how to make the most of them.

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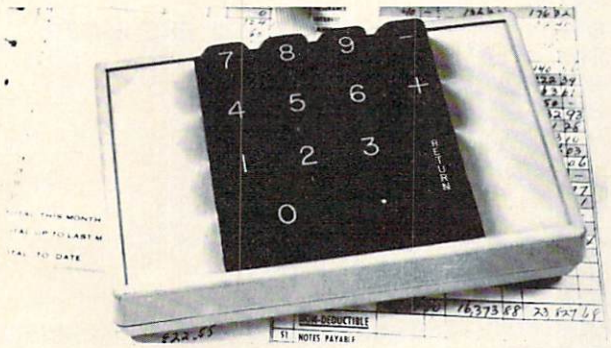

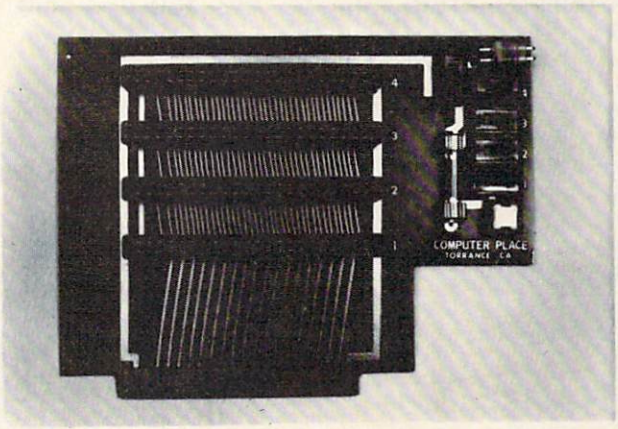

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LISTING 1

```
 0 A$="[REV]                              "
1 POKE53280,6:POKE53281,15:PRINT"[CLEAR
][RED]"A$A$A$"** SOUNDS GOOD ** "A$A$A$
2 PRINT"[SHIFT-2]  COPYRIGHT IAN ADAM          J
UNE 1983[DOWN]
3 PRINT"  [RED]NOTE:[SHIFT-2]  THE ARTICLE ACCO
MPANYING THIS"
4 PRINT"  PROGRAM PROMPTS THE READER TO
 MODIFY    THE SOUND-CREATING PROGRAM W
HILE HE
5 PRINT"  READS, TO DEMONSTRATE A SERIE
S OF":PRINT"  EFFECTS.
6 PRINT"  FOR YOUR BENEFIT, THESE EFFEC
TS HAVE":PRINT"  BEEN COMBINED INTO ONE
 PROGRAM.
7 PRINT"  YOU MAY SELECT:[DOWN]":PRINT"
1-3   FREQUENCY SWEEPS":PRINT"4,5   RIN
G MODULATION
8 PRINT"6,7   SYNCHRONIZATION":PRINT"8
    RING MOD + SWEEP":PRINT"9      BEATI
NG
9 PRINT"10    ENVELOPE GENERATOR":PRINT
"11-13 SIRENS":PRINT"14    BUBBLING":PR
INT"15    TELSTAR[HOME]
10 SI=54272:W1=SI+4:W3=SI+18:V=SI+24:PW
=SI+27:PE=SI+28
20 FORI=SITOPE:POKEI,0:NEXT
30 POKEW1+1,17:POKEW1+2,251:POKEW3+1,18
7:POKEW3+2,140
40 POKEV,143:POKEW3,17
50 POKE214,22:PRINT:POKE211,27:INPUT"DE
MO #     [LEFT][LEFT][LEFT][LEFT]";D
60 ONDGOSUB150,250,350,450,550,650,750,
850,950,1050,1150,1250,1350,1450,1550
70 :
80 :
90 :
100 POKEV,0:POKEW1,0:POKEW3,0
110 GOTO20
147 :
148 :       #1   SWEEP
149 :
150 POKEW1,17
160 FORI=30TO200STEP3:POKESI+1,I:NEXT
170 RETURN
247 :
248 :       #2   WHISTLE
249 :
250 POKEW1,17
260 FORI=30TO200STEP3:POKESI+1,I:NEXT
270 POKEW1,0:FORI=1TO150:NEXT:POKEW1,17
280 FORI=30TO120STEP3:POKESI+1,I:NEXT
290 FORI=120TO20STEP-1.5:POKESI+1,I:NEX
T
300 RETURN
347 :
348 :       #3   ROCKET
349 :
350 POKEW1+2,253:POKEW1,129
360 FORI=0TO90:POKESI,0:POKESI+1,I
370 FORJ=1TO254-ISTEPI/20R1:POKESI,J:NE
XTJ,I
380 POKEW1,128:FORI=1TO5000:NEXT
390 RETURN
447 :
448 :       #4   RING MODULATION - GONG
449 :
450 POKEW1+2,122
460 POKEW1-3,30:POKEW3-3,23
470 FORI=1TO8:POKEW1,21
480 FORJ=1TO200:NEXT:POKEW1,20
490 FORJ=1TO1500:NEXT:NEXT:RETURN
547 :
548 :       #5   RING MODULATION - CHIME
549 :
550 POKEW1+2,122
560 POKEW1-3,50:POKEW3-3,56
570 FORI=1TO6:POKEW1,21
580 FORJ=1TO200:NEXT:POKEW1,20
590 FORJ=1TO1000:NEXT:NEXT:RETURN
647 :
648 :       #6   SYNCHRONIZATION
649 :
650 POKEW1-3,31:POKEW1,19
660 FORI=1TO8:POKEW3-3,4+I
670 FORJ=1TO300:NEXT:NEXT
680 RETURN
690 :
700 :
747 :
748 :       #7   SYNCHRONIZATION + WAVER
749 :
750 POKEW1-3,31:POKEW1,19
760 FORI=1TO15
770 :FORJ=0TO10:POKEW3-3,20+ABS(J-5):NE
XT
780 NEXT
790 RETURN
800 :
847 :
848 :       #8   RING MOD AND SWEEP
849 :
850 POKEW1-3,31:POKEW1,21
860 FORI=1TO175STEP.1
870 POKEW3-3,I:NEXT
880 RETURN
890 :
900 :
947 :
948 :       #9   BEATING
949 :
950 POKEW1-3,13:POKEW3-3,12:POKEW3-4,22
5:POKEW1,21
960 FORI=1TO3000:NEXT:POKEW1,20
970 FORI=1TO1500:NEXT:RETURN
980 :
990 :
1047 :
1048 :      #10  ENVELOPE GENERATOR
1049 :
1050 POKEW1+1,187:POKEW1+2,140:POKEW1,3
3
1060 POKEW3,0:POKEW3,33
1070 FORI=1TO150:POKEW1-3,PEEK(PE)/3+10
:NEXT
1080 POKEW1,32:POKEW3,32
1090 FORI=1TO300:POKEW1-3,PEEK(PE)/3+10
:NEXT
```

Continued on page 146

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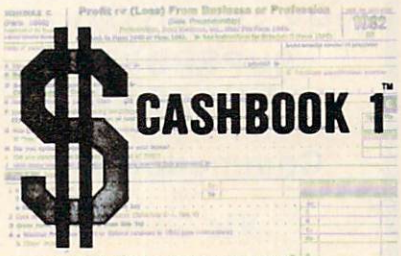

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Continued from page 144

```
1100 RETURN
1147 :
1148 :      #11  SIREN #1
1149 :
1150 POKEW1+1,224:POKEW1+2,253
1160 POKEW3-4,15:POKEW1,33
1170 POKEW3,17
1180 FORI=1TO500:POKEW1-3,PEEK(PW)/10+2
5:NEXT:POKEW1,32
1190 FORI=1TO500:POKEW1-3,PEEK(PW)/10+2
5:NEXT
1200 RETURN
1247 :
1248 :      #12  SIREN #2
1249 :
1250 POKEW1+1,224:POKEW1+2,253
1260 POKEW3-4,15:POKEW1,33
1270 POKEW3,33
1280 FORI=1TO500:POKEW1-3,PEEK(PW)/10+2
5:NEXT:POKEW1,32
1290 FORI=1TO500:POKEW1-3,PEEK(PW)/10+2
5:NEXT
1300 RETURN
1347 :
1348 :      #13  SIREN #3
1349 :
1350 POKEW1+1,224:POKEW1+2,253
1360 POKEW3-4,15:POKEW1,33
1370 POKEW3,65:POKEW3-1,8
1380 FORI=1TO500:POKEW1-3,PEEK(PW)/10+2
5:NEXT:POKEW1,32
1390 FORI=1TO500:POKEW1-3,PEEK(PW)/10+2
5:NEXT
1400 RETURN
1447 :
1448 :      #14  BUBBLING
1449 :
1450 POKEW3-3,15:POKEW1,17
1460 POKEW3,129
1470 FORI=1TO300:POKE54273,PEEK(54299)/
7+3:NEXT
1480 RETURN
1490 :
1547 :
1548 :      #15  SATELLITE
1549 :
1550 :
1560 POKEW3-3,15:POKEW1,19
1570 POKEW3,129
1580 FORI=1TO300:POKE54273,PEEK(54299):
NEXT
1590 RETURN
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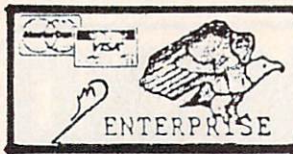

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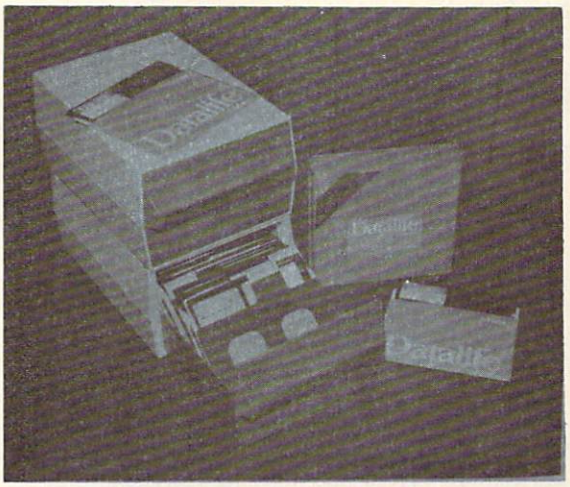

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VIC-20 AND COMMODORE 64 ARE TRADEMARKS OF COMMODORE BUSINESS MACHINES, INC.

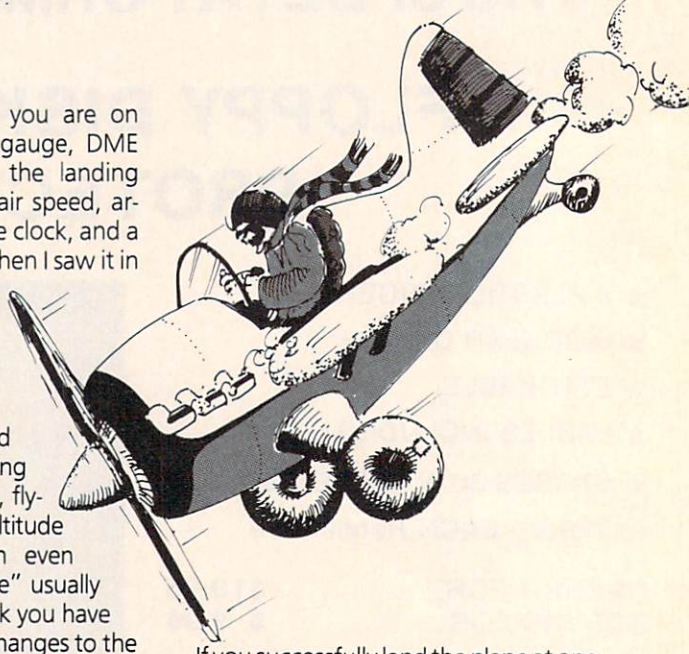
Runway 20

REVIEW *By Jim Grubbs*

TITLE: ***RUNWAY 20***
FORMAT: Cassette or Disk
PRICE: $25.00 shipping and handling included
LANGUAGE: Basic
MODEL: VIC-20 with 16K
AUDIENCE: Pilots and would-be flying aces
SUMMARY: Simulates in game form flight of small aircraft
SOURCE: Susie Software
709 Wilshire Drive
Mount
Prospect,IL 60056
RATING: Good

Performance:

I grew up as an air force dependent, always near an airport and fascinated by flying machines of all shapes and sizes. One of my big disappointments as a youngster was that due to a depth perception problem, I would never be able to fly commercially or be an astronaut. I was searching for a flight simulator for my Dad's VIC. After retiring from the air force, he taught aerospace science and is truly impressed with all the things his VIC can do. Runway 20 seemed to be the perfect birthday present for him. Delivery time on the program was a bit long, but no longer than many mail order houses. The cassette I ordered loaded without difficulty, and even on a black and white monitor the graphics are truly impressive! It takes a few "flights" to get oriented to the cockpit. The instruments are there, though: a compass that scrolls and flashes yellow when you are on course, an altimeter, fuel gauge, DME (estimated distance from the landing field), flaps, landing gear, air speed, artificial horizon, elapsed time clock, and a "view out the window"! When I saw it in color I was very impressed.



Keep in mind that Runway 20 is marketed as a game, not a flight simulator. In this respect it keeps "score", awarding and taking away points depending whether you are on course, flying at the recommended altitude and so on. The program even throws in some "turbulence" usually just about the time you think you have everything under control. Changes to the flying parameters may be input from either the keybord or a joystick. Even if you use a joystick, certain fuctions still must be controlled from the keyboard.

My only complaint is the speed with which the controls react. Forget the joystick–it takes forever. Keyboard inputs are recognized somewhat slowly, no doubt due to the use entirely of BASIC and all the things on the screen that must be kept updated. After about 10 miserable attempts at flight, I finally got the feel for how much to "lead" my inputs in order to accomplish the desired result. After that, the game became a lot of fun!

If you successfully land the plane at one of the six randomly selected fields, your total score is calculated and you receive a critique of your flight.

All in all, I would heartily recommend this program for its entertainment value. I do not recommend it to use for flight training–it's just too slow. A similar program, Runway 64, is available for the C-64.

Documentation:

A single instruction sheet is included. It is fairly comprehensive, but could use some graphics to familiarize you with where to find things when you first run the program.

Jeff and Marilyn Mitchell "designed" their new program themselves. CodeWriter wrote all the computer code. The Mitchells' dream is thriving on fulfilling other people's wishes. Their new home business needs very special information fast: Which fantasies are still open? What's our next completion date? Can we get a list of all fantasies needing out of state travel?

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Circle No. 159

GAME CONTEST

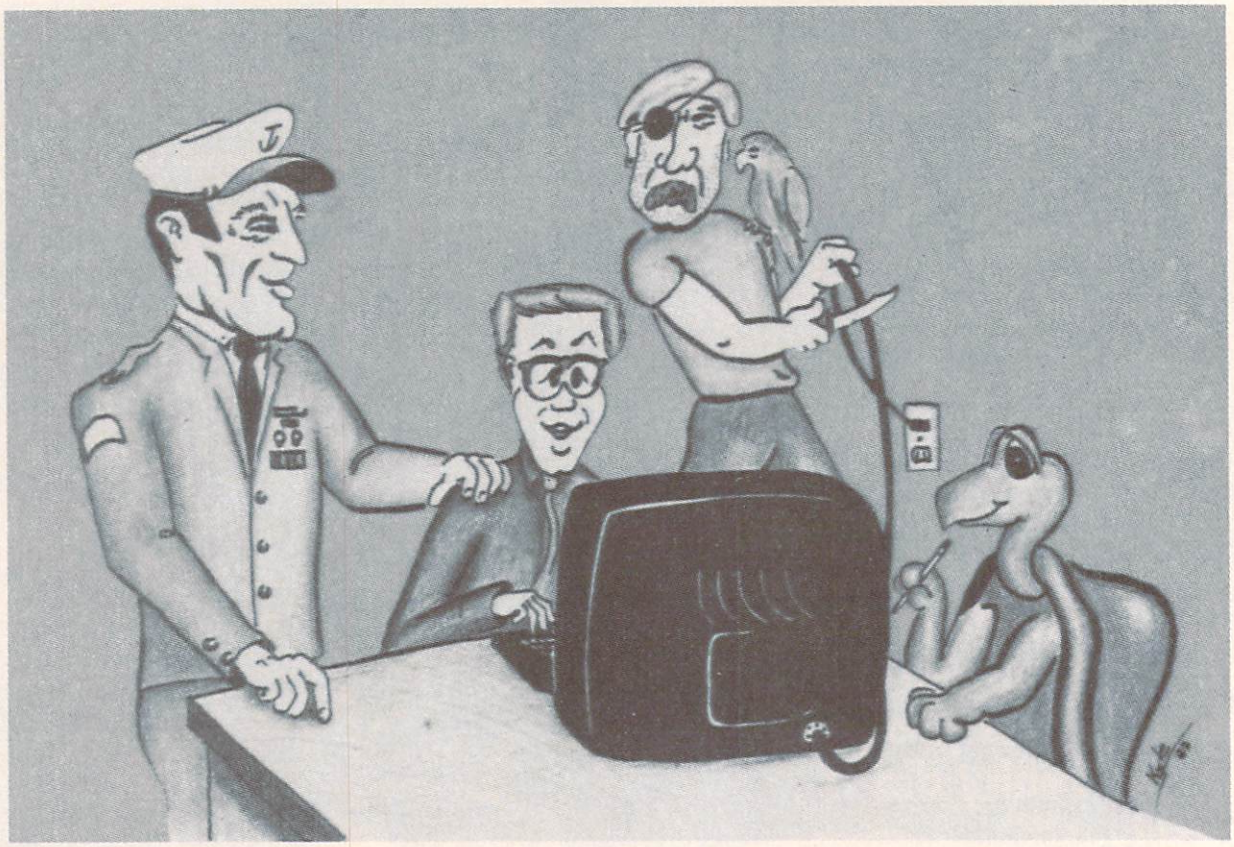

Illustration: Courtesy of Tamarack Software.

The contest will end March 15, 1984. Entries must be mailed to *COMMANDER,* Your Program in Pilot Contest, PO Box 98827, Tacoma, WA 98498. Your program must be on diskette or cassette, and include a copy of your sales receipt or invoice. All entries will become property of Tamarack Software, Inc., and will be nonreturnable unless accompanied by a self-addressed mailer with sufficient postage attached.

DEADLINE FOR ENTRIES
MARCH 15, 1984

VANILLA PILOT or PILOT II may be purchased from any one of Tamarack Software's fine dealers.

TERMS FOR GAME CONTEST

A new twist to the Game Contest. The time has come for you to try your hand at programming. Who can write the best program in VANILLA PILOT or the new PILOT II?

Stop! Don't try pressing the panic button—we hid it! Anyway, it's easy! People from kindergarten to grandpas are already using VANILLA PILOT and loving it. Now with our advanced Pilot, you get a double scoop—an easy to use Pilot language using virtually all the capabilities of the Commodore- 64 and an expanded manual to help you learn.

OK, got your thinking cap on? Here's the rules, You can write any kind of program that your mind can dream up. Make it innovative—we will be looking for the best idea and how well you programmed that idea. Anyone can enter, except employees of Tamarack Software, Inc., and their families. The grand prize of $150 will go to the best overall program. There are two first prizes of $75 and two second prizes of $50 to be awarded to two groups, one—Jr. High and younger, and two—High School and up.

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News Releases

NEW HEADQUARTERS

Computer Center Inc. is proud to announce the grand opening of their new corporate headquarters located at 253 West 35th Street in New York City.

The eight thousand square foot facility will include a full service-training division featuring a total support staff. Computer Center's new 3,000 square foot warehouse will accommodate this new phase in their rapid growth.

Computer Center's new facility will act as the control center for the ongoing expansion of their retail store chain, allowing for the addition of three new retail locations by 1984.

If you have any questions please call Mr. Michael Dubno at (212) 563-7280.

COMMODORE CONTINUES REALIGNMENT OF SALES ORGANIZATION

West Chester, PA–Commodore Business Machines, Inc. announced today the latest activities in the realignment of its field sales organization. These steps continue a process initiated in March to bring its sales support structure more in line with its expanded distribution base.

The Commodore Field sales force is being grouped into five (5) separate activities to provide better, and more direct support to Commodore's key customer segments:

1. Education
2. Professional Dealers
3. Distributors
4. Direct Retailers
5. National Accounts

Field support centers in Philadelphia, Chicago, Dallas and Los Angeles will continue to provide regional service, administrative and technical support. Customer support activities at these locations will be strengthened.

These changes have been made to reflect the changing marketplace and ensure that Commodore builds on the distribution channels that have made Commodore the #1 computer supplier in both the USA and the world.

Jack Tramiel, Vice Chairman, Commodore International, Ltd. said, "Our new organizational structure will better equip us to meet the challenges that will unquestionably face the industry. Our 1983 fiscal year has been enormously successful. Commodore is committed to remain number one in both hardware and software sales in the coming year. We will accomplish this only by getting closer to our distribution."

TAX COMMAND PREPARES INDIVIDUAL TAX RETURNS!

Brookfield, Wis., —TAX COMMAND, a Federal Income Tax calculation program, is now in its second year of publication. It provides a line by line method of calculating income tax for federal tax forms, including form 1040, income averaging, Schedule A-itemized deductions (including medical), capital gains and losses and contains all tax tables for every filing status. On computers with over 48K, Tax Command includes numerous other schedules as well.

Tax Command is easy to use. It does all mathematical calculations automatically, contains built-in tax tables that calculate your tax refund or payment, and tells when to income average. While the program does not print on the actual form, in most versions it does print (or list if you do not have a printer) each entry needed on your tax form.

Since this is its second year of distribution, all known "bugs" on Tax Command have been eliminated, and the program has been extensively tested and marketed. Users of last year's program liked the control it gave them over the tax preparation process, especially the ability to make changes and test options.

Suggested retail is $24.95. Tax Command has been developed for the Commodore 64 and the VIC-20. Tax Command is available for dealer and distributor sales and also for individual sales. Contact: Practical Programs, 17850 Wessex Drive, Brookfileld, WI 53005. (414) 278-0829.

PERSONAL COMPUTER SHOW DEMONSTRATES SPREADSHEETS WITH PRACTICALC

Computer Software Associates president Sandow (Sandy) Ruby was the recent featured guest on the Personal Computer Show, a cable TV-syndicated program devoted to the world of computers. Ruby, author of the PractiCalc series, demonstrated how a spreadsheet operates, illustrating his talk with CSA's program, PractiCalc 64. He was joined on the show by Robert Shapiro, executive vice president of Micro Software International, the firm that distributes and markets CSA products worldwide.

John Edson, co-host of The Personal Computer Show, explained, "Most of our viewers already have, or are planning to purchase home computers in the near

future. A large number of them own Commodores and want to know about the kinds of programs that are available to them, particularly in the home, business and educational areas. We were very excited to have Sandy on the show to demonstrate his *PractiCalc* program, giving our audience a chance to see how a spreadsheet operates, the kinds of calculations it can do, and some of its practical applications."

The *PractiCalc* segment was aired via the Satellite Program Network (SPN) cable network between July 26 and August 3, and was shown to over 900,000 viewers. Ruby returns to the show for two more engagements: one later in August, where Ruby will demonstrate CSA's tutorial *VID PAK #1*, and a third segment scheduled for the Fall, where he will show the ins and outs of *PS: The Programmable Spreadsheet*.

Ruby is very excited about his three appearances on The Personal Computer Show, commenting, "They give us an opportunity to show large numbers of people how a spreadsheet works. The *VID PAK #1* portion is aimed at novice computerists who are just learning about their machines and want to know how to run their micros. The *PS* segment will again bring the spreadsheet to the fore. This time, it will show the unique aspects of *PS*, with its modular subroutines that are programmable in BASIC, a feature that is not available on any other spreadsheet."

The Personal Computer Show is taped in San Antonio and appears throughout forty-two states, Puerto Rico and Guam.

PractiCalc puts a byte on TV

Robert Shapiro, Executive Vice President of Micro Software International, left, and Sandy Ruby, President of Computer Software Associates, center, join co-host John Edson on The Personal Computer Show. Ruby, author of *PractiCalc*, demonstrated the functions of a spreadsheet. He's slotted for two return engagements, showing off *VIC PAK #1* and *PS: The Programmable Spreadsheet*.

VIC-20 HITS, PIPES AND ASTROBLITZ, TRANSLATED FOR THE COMMODORE 64

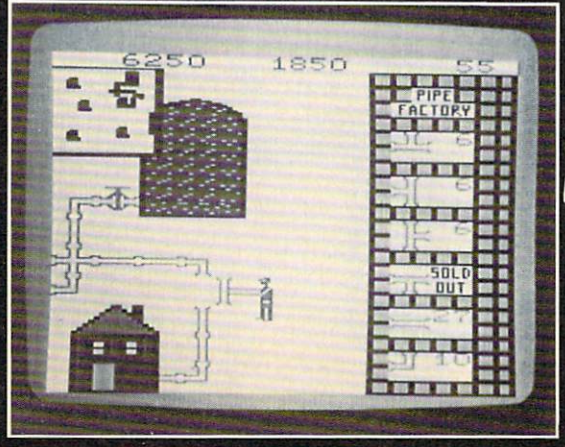
Sunnyvale, CA–*Astroblitz*, a popular space "shoot-'em-up" game, and *Pipes*, an award winning educational program, have been released for the Commodore 64.

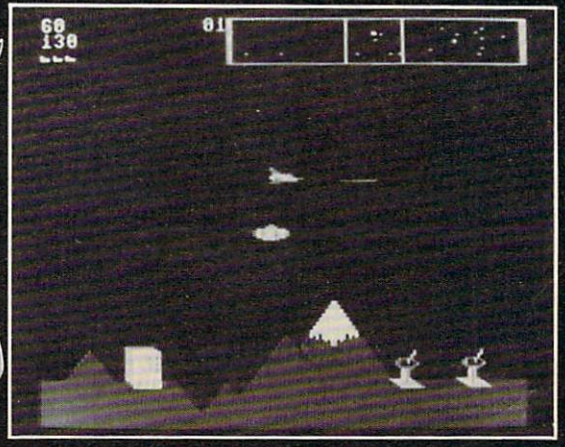
Pipes is an educational program that plays like a game while teaching the concepts of spatial relationships and economics. The object of *Pipes* is to connect all the houses in town to the main water supply. A joystick is used to direct "Arlo the Plumber" from the factory, where he carefully selects the right pipe, to the work-site where he attaches it. Arlo can select elbow-joints, T-joints and valves, each with differing dollar values and inventory limitations, to create a cost-effective and efficient water network. If the pipes are not connected and sealed properly, there will be leaks and the game will end.

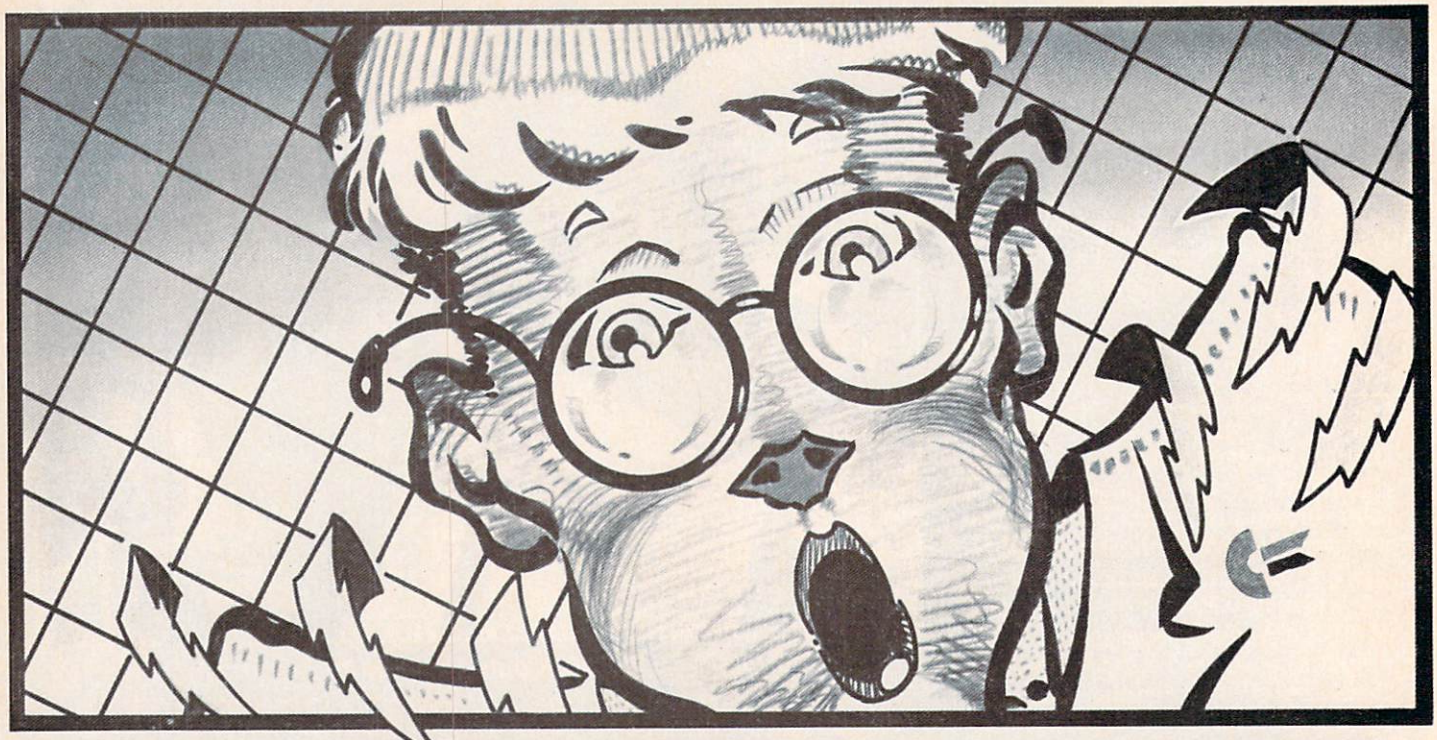
Astroblitz features the player as the last surviving pilot of an interplanetary patrol squadron. In order to save planet Nahad, he must maneuver his rocketship around alien fire and fallout from volcanoes while destroying spinners, saucers, seekers and radar dishes. When the player has destroyed all the space enemies, he must move on to save other planets with even more aliens to destroy.

Astroblitz and *Pipes* are available for the Commodore 64 in cartridge format a suggested retail price of $34.95.

Creative Software is the largest independent publisher of VIC-20 software in the United States. The company is dedicated to offering a full line of software for entry-level computers. Headquarters are located at 230 East Caribbean Drive, Sunnyvale, CA 94089.







NEW PRODUCTS

CIMARRON INTRODUCES MAJOR LINE OF SOFTWARE FOR THE C-64

SANTA ANA, CA–The INSTA series software line of productivity software for the Commodore 64 personal computer was announced by Cimarron Corporation, a three-year-old manufacturer of vertical market application packages for the Commodore line of business computers.

The INSTA series consists of *nine* initial packages targeted for the first time computer user in the home, the office and places in between.

The packages are INSTA-WRITER, a cartridge-based word processor which features "instant on" operation and a greatly simplified approach to generating computer documents.

INSTA-MAIL is a mail list program featuring mail merge, alpha sorting and label printing.

INSTA-CALC, a low cost financial spreadsheet program features a mnemonic command structure, a self-instructing tutorial, instant HELP SCREENS and graphing capability.

Home investors will appreciate INSTA-VESTOR, a stock management program which tracks BUYS and SELLS, calculates moving stock price averages and computes earnings.

For data base management tasks such

as filing, sorting, merging, and modifying user defined fields, INSTA-FILE is very useful. And, through a software "link" to INSTA-WRITER, a complete REPORT WRITING facility is available.

INSTA-SCHED is a cartridge-based, machine code module that allows the user to manage appointments via a monthly calendar system.

INSTA-CHECK, through a series of simple but complete ledger codes, helps create an error free environment for assisting in control of personal finances.

INSTA-GRAPH works as a stand-alone graphing module or interacts with INSTA-CALC or INSTA-VESTOR to plot bar charts (historgrams) or line graphs.

INSTA-SPEED, a BASIC compiler, increases the speed of a BASIC program by up to 55 times and reduces normal program size by 20% to 50%.

INSTA series software prices range from $34.95 to $99.95. Point of purchase displays, collateral material and ad reprints are also offered. Circle No. 250

For more information contact Headquarters at 2158 South Hathaway Street, Santa Ana, CA 92705, (714) 662-2801.

BRODERBUND RELEASES "DAVID'S MIDNIGHT MAGIC" FOR THE COMMODORE 64

SAN RAFAEL, CA . . . Broderbund's first of several programs anticipated for the Commodore 64 is available now.

An award winning pinball game already well-known to Apple and Atari computer users, DAVID'S MIDNIGHT MAGIC is sure to bring out the pinball wizard in Commodore 64 owners as well.

Anyone who has never challenged a real pinball machine (and those who have) will experience the next best thing in this fast action computer game that simulates dual flipper controls, bumper action, rollovers, multiple ball play, and all the sounds and lights of a classic arcade pinball unit. You can even "put English on the ball" and jostle the machine–but overdo it and you'll ring up a tilt! Color and graphics are the same outstanding quality expected from Broderbund!

DAVID'S MIDNIGHT MAGIC by David Snider (conversion by Martin Kahn) is available on disk for the Commodore 64 at a suggested retail price of $34.95.

For more information on this and other Broderbund products, please contact Lois Levin, Director Public Relations, Frank Barth, Inc., 500 Fifth Avenue, New York, NY 10110 (212) 398-0820.
Circle No. 251

WORD GAME FOR THE C-64!

CRYPTOWORD™ 64 is a word game for one to four players. The play consists of forming words using letters randomly generated by the computer. Game options allow the players to select the number of letters used during play, the winning score, whether spelling errors can be corrected, and the time limit each player will have to form a word. The game options selected can be reviewed and changed or corrected before play begins. Words are accepted or rejected by the next player in the order of play. Each player can pass the alphabet generated by the computer if a word cannot be formed.

Immediately available for the Commodore 64. Requires a set of game paddles for each two players.

Price: $14.95 on tape, $19.95 on disk.

For further information contact Puzzle King, Ltd., P.O. Box 1337, Cupertino, CA 98015, Phone (408) 733-0739 Circle No. 252

WORD GAME FOR THE VIC-20

CRYPTOWORD™ THREE is a word game for one or two players. The play consists of forming words using letters randomly generated by the computer. The players select the number of letters used in the game and the winning score from menus. Spelling errors can be corrected before a word is completed. The time allowed for each player to form a word can be limited. The game options selected can be reviewed and changed or corrected before play begins. Each player accepts or rejects the words formed by the opposing player. Players can pass the alphabet generated by the computer if a word cannot be formed.

Immediately available for the VIC-20. Requires an 8K memory expander and game paddles.

Price: $14.95 on tape, $19.95 on disk.

For further information contact Puzzle King, Ltd., P.O. Box 1337, Cupertino, CA 95015, Phone (408) 733-0739 Circle No. 253

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Programs and examples using those programs are provided as learning aids and subsequent investment tools.

COURSE I: "How To Make Good Investments" comes complete with text and programs on cassette for $39.95.

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NEW BOOK FOR SOFTWARE MARKETING

How to Effectively Market Your Computer Software, by Celestial Software: $19.95. This is a sourcebook for those marketing and/or developing software. Subjects covered include copyright procedures, license agreements, software distributors, information on over 150 computer magazines and publications, software directories, cassette and disk duplication, software author's markets, and more. Available from Celestial Software, 3010 Warrington Ave., Lakeland, FL 33803. For more information contact Lee Woas at the above address. Circle No. 255

NEW PERIODICAL TO AID PHYSICIAN COMPUTER USERS

ATLANTA, GA–A new medical newsletter, *Physician Computer Monthly,* provides information to the growing number of doctors who use micro and minicomputers in their practices.

This 12-page, independent periodical covers computer applications for practice management, patient care, continuing medical education, and communications. Written in non-technical language, *Physician Computer Monthly* emphasizes practical uses of computers by physicians.

One year subscription is $95. A sample issue will be provided free to physicians upon receipt of letterhead request; non-physician samples, $2.00 each. Write *Physician Computer Monthly,* 67 Peachtree Park Dr., Atlanta, GA 30309.

Physician Computer Monthly joins eleven other newsletters published by American Health Consultants, a ten-year-old medical communications firm.

For more information contact Scott Wilson, (404) 351-4523. Circle No. 256

NEW LOW COST INTERACTIVE COMMODORE COMPUTER/VIDEO INTERFACE

The VIDEOBOOK CORPORATION of Seattle announces a new COMPUTER/VCR INTERACTIVE INTERFACE and AUTHORING SYSTEM for the Commodore 64 and the VIC-20 computers and home videocassette recorders. The new interactive interface, called the PROMETHEUS 1™, will connect the VIC-20 or the Commodore 64 computers to any of the older Panasonic 5000 series videocassette machines or to the newer Panasonic 6500 or 8500 standard VCRs. The PROMETHEUS 1™ will also connect various models of Magnavox, Canon, and Hitachi VCRs to the computers. A retrofit mod kit for solenoid VCRs that do not have the required input plug will be available before Christmas, 1983. The interface costs $49.95 by direct mail.

This new module clears the way for mass development of the long anticipated VIDEOTAPE INTERACTIVE COURSEWARE MARKET.

The PROMETHEUS 2™ Interface will connect your Commodore or VIC to the Pioneer 1100 Laser Disk machine. The PROMETHEUS 3™ connects the Commodore or VIC to the RCA CED Interactive Disk machine. These interfaces will sell for $199.00.

VIDEOBOOK CORPORATION
COMP-U-TUTOR INTERACTIVE COMPUTER/VCR AUTHORING SYSTEM
PROMETHEUS 1 INTERACTIVE COMPUTER/VCR INTERFACE

All of these units use the same Comp-U-Tutor™ Authoring System for complete computer/video interactivity.

Videobook intends to provide a complete system of computer and video components, paving the way toward the twenty billion dollar computer/video interactive coursewares market predicted by Dun and Bradstreet three years ago.

For more information, free literature, or the Videobook 1983 Computer/Video Interactive Educational Coursewares and Entertainment Catalog (for $14.95 + $2.00 shipping), send your inquiry to Videobook Corporation, P.O. Box 19597, Seattle, WA 98109, or call (206) 282-3636. Circle No. 257

CASINO ROULETTE

A casino style roulette game for the VIC-20 and Commodore 64 is available from Powerline Software.

The game uses sound, color and graphics, produces a roulette board display and places chips as bets are placed. Options selected when the game is started allow for European or American style play and for changing casino payoffs on winning bets. Up to 5 people may play at once and the game keeps a running tally for all players and the casino. Special prompts make placing bets through the keyboard quick and easy. Each player may wager up to 60 different bets.

A cassette tape version is available for the VIC-20 with an extra 8K, and both cassette and floppy disk versions for the Commodore 64.

Each version is available for $19.95 which includes shipping in the U.S. and a complete user's manual. Circle No. 258

Powerline Software
P.O. Box 635
New Hartford, New York 13413

PUZZLES FOR VIC-20

CRYPTOLOGIC™ ONE: CENTER LOGIC is a puzzle for one person. Successful solution of the puzzle requires the removal of "balls" from a square playing "board" with notched corners until a single "ball" remains in the center of the board. Five different playing "boards" are generated at random to provide additional challenge. The player can choose to play against the clock for even more challenge.

CRYPTOLOGIC™ ONE: PYRAMID LOGIC is a puzzle for one person. Successful solution of the puzzle requires the removal of "balls" from a pyramid playing "board" until a single "ball" remains in one corner of the "board".

Three different playing "boards" are generated at random to provide additional challenge. The player can choose to play against the clock for an even greater challenge.

Immediately available for the VIC-20. Requires an 8K memory expander and joystick. Circle No. 259

Price: $14.95 on tape, $19.95 on disk.

SIRIUS RELEASES TYPE ATTACK FOR COMMODORE 64

Sacramento, CA–Type Attack, the top-selling typing game from Sirius Software, Inc., is now available on disk for the Commodore 64 personal computer.

Developed by a game designer and a professional educator, Type Attack teaches typing skills in a fast-action arcade-style game. Groups of words and letters falling from the top of the playing field must be stopped by typing the same words or letters on the computer keyboard.

Type Attack includes 39 pre-programmed lessons designed to follow a standard typing course format, in such a way that the player automatically learns typing conventions and concepts while playing the game. Also featured are a Lesson Creator, with which the player can design lessons to help with specific typing or vocabulary problems, and a real-time words-per-minute bar with settings from 1 to 99.

Suggested retail price is $39.95. Type

Attack is also available on cartridge for the VIC-20.

Sirius Software, Inc., develops, manufactures and markets entertainment software. The company, founded in 1980, currently has over 70 games on the market. Circle No. 260

THE BANNER MACHINE

The Banner Machine, by Celia Durand, is a menu driven program that operates like a word processor, making it very easy to use. Prints signs in minutes, very useful in retail businesses, medical offices, schools or any organization with a need for large, eye catching signs. Prints greetings for celebrations in the home, signs for student elections and creates professional looking reports for school.

The Banner Machine makes signs up to 10″ tall by any length. Borders are variable, up to ¾″ wide. Eight sizes of letters are available from ¾″ to 6½″ high. Included areproportional spacing, automatic centering and right and left justification. Two modes of print, standard and compressed. A laminated template for the function keys is included. Several additional fonts are available. Use with any of the following printers: Epson MX with Graftrax, the FX or the RX; Gemini 10 or 10X. The Prowriter, Commodore 1525E and the Okidata with Okigraph versions available in September 1983. 8 bit printer interfaces are required. The BannerMachine is available for the Commodore 64 and the VIC-20.

The VIC-20 version requires 24K memory expansion.

Price: $49.94 Circle No. 261

THE BANNER MACHINE II

Exactly like the Banner Machine described above except it prints the sign in reverse. The background is black and the letters are the color of the paper used to print the sign. This is especially attractive using colored paper!

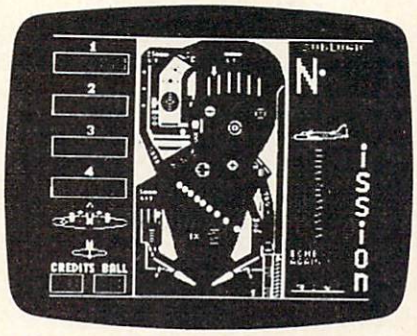
Price: $49.95

Mail Orders: Virginia Micro Systems, 13646 Jeff Davis Hwy., Woodbridge, VA 22191 Circle No. 262

Phone Orders: (703) 491-6502 Hours: 10 a.m. to 4 p.m., Monday thru Saturday.

SUBLOGIC ANNOUNCES AVAILABILITY OF NIGHT MISSION PINBALL FOR THE COMMODORE 64 COMPUTER

Night Mission Pinball from SubLOGIC is now available for the Commodore 64 computer. Written by Bruce Artwick, author of *Flight Simulator,* the program recreates the look and feel of a real pinball table down to the finest detail. The playfield has five bumpers, seven standup targets, nine rollovers, two spinners, and much more. One to four players may compete at a time.



The game's theme is based on a WWII night bombing run. Incredibly realistic sound affects actually place you in the cockpit of a B-17 Flying Fortress over war-torn enemy territory as you try to maneuver your ball down the bomb release line. Four standup targets control the bonus multiplier. A hole kicker can catch your ball, activating a number of bonus features before ejecting the ball back into play. The game allows you to keep up to four balls in play simultaneously.

Night Mission Pinball offers ten different modes of play, from COMPETITION to COSMIC. Forty user-adjustable program parameters allow you to create your own custom games or redesign any play mode to your own specifications. Joysticks are recommended but not required; keyboard control is available.

Night Mission Pinball for the Commodore 64 comes with a twenty-page adjustment manual and instruction card, and is available at most computer /software stores or from SubLOGIC direct. The program is available on disk or cassette for $29.95. For direct orders add $1.50 for shipping and specify UPS or first class mail delivery. Visa, MasterCard, American Express, and Diner's Club accepted.

For further information contact SubLOGIC Corporation, 713 Edgebrook Drive, Champaign, IL 61820, Phone (217) 359-8482, Telex: 206995 Circle No. 263

THE COLOR SHARPENER SOLVES PROBLEMS ON COMMODORE 64

BROOKFIELD, Wis.,–The Color Sharpener from Bytes & Pieces will solve the color resolution and intensity problems of the Commodore 64. The sharpener is an electronic unit that plugs into the Commodore 64 and substantially increases picture quality. It brightens the picture on any standard television and eliminates much of the common interference noticed when using the 64 with a regular television set. It requires no soldering, wiring or opening of the computer.

Suggested retail is $18.95 and it comes with a moneyback guarantee. Dealer inquiries are invited.

For additional information, contact Bytes & Pieces, 550 N. 68th Street, Wauwatosa, Wis., 53213. Circle No. 264

THREE SOPHISTICATED C-64 GAMES FROM STRATEGIC SIMULATIONS

KNIGHTS OF THE DESERT is a faithful recreation of the North African campaign of World War II in which the British troops held off the sweep of Rommel's Panzer divisions as they moved toward Alexandria. Containing division/regiment-sized units of infantry, motorized infantry and tanks, KNIGHTS OF THE DESERT introduces an innovative system of play: during logistics phase, the players must first assign supply and re-supply priority for each unit—before moving it. The operations phase allows multiple movements per turn by one player while permitting the opponent to make reaction and limited reaction moves.

COMBAT LEADER offers a complete strategy game where you are in charge of a battle force of tanks and mechanized infantry against a similarly equipped enemy (controlled by the computer). The game has a scrolling battlefield, the ability to choose the level of command, platoon or squad leader, and the choice of over 70 tanks at your disposal. Each tank is historically rated for armor thickness, strength, speed and fire accuracy.

PROFESSIONAL TOUR GOLF gives you a choice between two different championship courses: the famed seaside course at Pebble Beach, or a course which was created from the most famous and difficult holes from courses around the world, such as the Augusta National, Merion and Oakmont. Twenty of the best players have been realistically recreated, each rated according to his power, accuracy and skill. You can play against these famous pros, play alone, or against your skillful friends.

Each program, complete with rulebook, is available on C-64 disk for $39.95 from Strategic Simulations, Inc., 883 Stierlin Road, Blds. A-200, Mountain View, CA 94043. Circle No. 265

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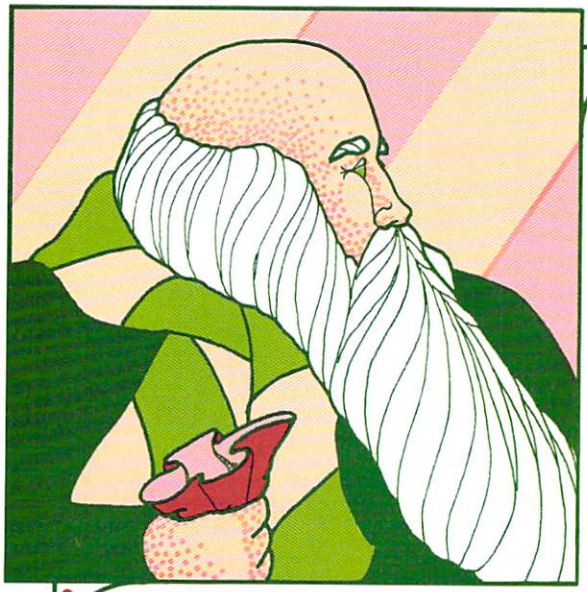

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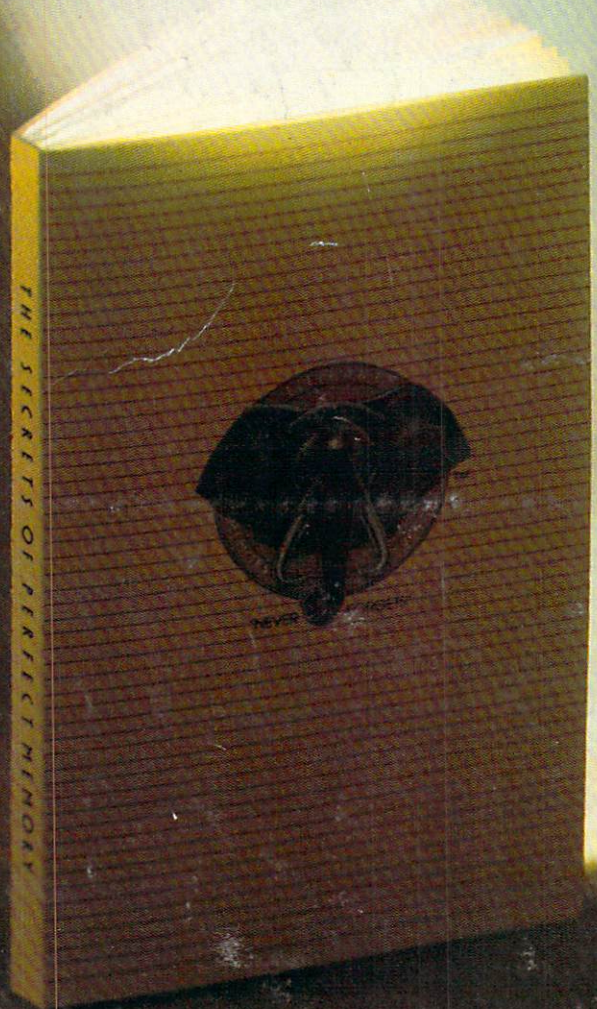

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